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VOLUME NO. 3

EXPLANATORY NOTES

FOR

DEPARTMENT OF AGRICULTURE

BUDGET ESTIMATES

FISCAL YEAR

1943

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FOREST SERVICE

(a) GENERAL ADMINISTRATIVE EXPENSES

Appropriation Act, 1942, plus	
\$6,510 supplemental for within-	
grade promotions .....	\$605,030
Proposed transfer in 1943 es-	
timates: To "Salaries and Expenses,	
Private Forestry Cooperation".....	- 12,178
Total available, 1942 .....	592,892
Budget estimate, 1943 .....	579,000
Change from 1942:	
Net reduction in working funds .....	- 20,000
Additional for administrative	
promotions .....	+ 6,108
Net decrease .....	-15,892

PROJECT STATEMENT

Project	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. General administration and business service .....	\$597,020	\$586,382	\$566,382	-\$20,000 (1)
2. Net cost of within-grade promotions.	- -	6,510	12,618	+ 6,108
Unobligated balance .....	1,500	- -	- -	- -
Total .....	598,520	592,892	579,000	- 15,892

DECREASE

(1) The decrease in working funds of \$20,000 in this item for 1943 will be met primarily by reducing expenditures for informational and educational work dealing with forestry activities.

WORK UNDER THIS APPROPRIATION

The work under this appropriation provides for the leadership, coordination, planning, and control of the Forest Service organization which has to meet the responsibilities of the Bureau as shown below, and for the formulation of broad basic policies and methods for the guidance of the personnel of the Service in creating and maintaining a forest economy which will advance human welfare and which will, in times like the present, provide the nation with adequate supplies of wood and wood products. It provides also for the service and facilitating agencies which are necessary in the central office relating to personnel management, information and education, drafting, business management, procurement, and finance and fiscal control, as well as for the necessary inspection and audit of field operations.



The organization of the general administrative divisions consists of the Chief's office proper, Personnel Management, Fiscal Control, Information and Education, Operation, and the sections of Forest Land Planning, Drafting, the library and photography.

The Forest Service has three major responsibilities. They are:

- a. The protection, management, development and utilization of 177,652,000 acres of land within the National Forests, equivalent to 9 percent of the area of the continental United States.
- b. The promotion of good forest practices, including the protection of forests, on the 428,000,000 acres of State and private lands.
- c. Forest and range research for all forest and open range lands.

The primary function of the Forest Service is to effectuate the responsibility of the Federal Government in working out solutions of the Nation's forestry problems.

On the national forests this means direct technical management for the production of timber, forage for range livestock, water, wildlife, and recreation. It means the protection of vast areas of public and intermingled private lands from fire and tree diseases, as well as the integration of the management of all forest resources, in order that they will contribute as fully as possible to economic and social betterment. It means, in short, the administration of the national forests in the broadest public interest and the demonstration of proper forest and related land management.

On the privately owned forest lands, which in major part are being badly handled from a national point of view, it means leadership, planning, and coordination in the development of forest management, through the dissemination of technical information and through cooperation with the States and private agencies in protection against fire, forest planting, and in obtaining improved forest management practices.

The attainment of these objectives requires the conduct of a large amount of research in all phases of forestry and forest range management, both independently and in cooperation with other technical and industrial agencies. Research in the technique of protecting, improving, and utilizing the forest resources and in the profitable use of land for forestry is essential to the success of the activities on the national forests and private forest lands. This research deals with problems of broad regional or national scope rather than those of a purely local character and is conducted under the provisions of the McSweeney-McNary and Clarke-McNary Acts.

Operating in three broad fields of activity, through its many field and cooperators' offices, the Forest Service is confronted with a complex and unusually difficult general administrative problem. There are approximately 1,000 field offices of the Forest Service, the majority of which are "one-man offices", where the opportunities for personal contacts with other employees are infrequent. Under these conditions there must be a







constant flow of information and instructions from the central office to the field on policy and other matters. Frequent inspections and audits are also necessary.

With an awakened public interest in conservation generally, and particularly in forestry, the demands made by the public for information are unusually heavy. Requests for information from Congressmen, Senators, schools, colleges, women's clubs, associations, civic organizations, and individuals, demands for the construction of certain projects, and the participation of outsiders in personnel, claims, and other cases all add to the work of the central office. The proper integration of Forest Service programs with the programs of other Federal agencies, especially those engaged in national defense, is also time-consuming.

The work of the Forest Service is closely allied with that of many other Government agencies, notable Soil Conservation Service, Bureau of Entomology and Plant Quarantine, the Division of Grazing, Bureau of Plant Industry, Public Roads Administration, Fish and Wildlife Service, Bureau of Agricultural Economics, Agricultural Experiment Stations, National Resources Planning Board, etc. Because of the enormous areas of Federally-owned lands under its jurisdiction and the leadership expected of it in forestry matters nationwide, the activities of the Forest Service are also of great importance to State, county, and regional planning boards. Under these circumstances, the general administrative functions of the Forest Service, especially those of planning, coordination, and policy formulation, are of unusual importance and make heavy time demands.

Because of its numerous fields of responsibility and resulting activity throughout the forested sections of all the States and territories, the Forest Service organization is of necessity and as a result of thorough study, test, and deliberate choice very thoroughly decentralized. The Division of Fire Control, for example, with responsibility for leadership and control (1) over a field force of from 5,000 to at times more than 20,000 persons engaged primarily in fire control work, and (2) over expenditures up to 10 million dollars a year, is composed in the Washington office of only 4 persons above the clerical grade. The other functional divisions in the main office are similarly restricted in size.

#### SUPPLEMENTAL FUNDS

Project	Allotment, 1941	Estimated allotment, 1942	Estimated allotment, 1943
<u>Emergency Relief Appropriation:</u> General administrative expenses...	\$34,641	\$7,650	- -



(b) NATIONAL FOREST PROTECTION AND MANAGEMENT

Appropriation Act, 1942, plus \$129,046  
 supplemental for within-grade promotions ...\$11,179,457

Budget estimate, 1943 ..... 11,283,095

Change from 1942:  
 Additional for administrative promotions ... 103,638

Increase ..... 103,638

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. General management, operation, and regulation of national forest properties, including enforcement of Federal laws and regulations applicable to the national forests .....	\$4,400,014	\$4,403,801	\$4,403,801	- -
2. Maintenance of improvements other than roads and trails (includes telephone lines, fences, lookout towers and observatories, fire breaks, offices, barns, garages, dwellings, outhouses, water developments, pipe lines, public camp grounds, landing fields, etc) .....	392,687	393,025	393,025	- -
3. Forest fire control, including prevention of fires and maintenance of a detection and "smoke-chaser" organization .....	2,263,748	2,265,698	2,265,698	- -
4. Control of tree-destroying insects and rodents on national forests .....	95,574	95,674	95,674	- -
5. Timber and forest products sales, free and administrative timber use, timber surveys, management plans, and timber stand improvement .....	1,330,126	1,429,838	1,429,838	- -
6. Allocation and issuance of grazing permits, supervision of range use by domestic livestock, range surveys and range management plans on national forests ..	576,195	576,691	576,691	- -



PROJECT STATEMENT - Continued

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
7. Protection of the wildlife resource, preservation of forest conditions conducive to the propagation of wildlife, reduction in number of game animals in overstocked areas, wildlife surveys, and management plans ...	\$241,441	\$241,649	\$241,649	- -
8. Supervision of recreational use of national forests, including plans, operating, policing, enforcing State sanitary laws, and garbage disposal on public camp grounds .....	400,567	400,912	400,912	- -
9. Land use management on national forests, including rental of land; land classification; action on claims entered under public land laws; location and posting of national forest boundaries; general surveys, plans and maps, aerial photography; land exchange .....	616,062	616,577	600,234	(1) -\$16,343
10. Protection, development and management of the water resources of the national forests..	72,321	72,384	72,384	- -
11. Construction of improvements other than roads and trails. (Includes telephone lines, fences, lookout towers and observatories, fire breaks, offices, barns, garages, dwellings, outhouses, water developments, pipe lines, public camp grounds, landing fields, etc.) .....	114,629	164,686	164,686	- -
12. Reforestation of demuded national forest areas .....	374,742	375,065	375,065	- -
13. Hazard reduction, fire prevention, and timber use, White Mountain National Forest .....	72,688	- -	- -	- -
14. Net cost of within-grade promotions .....	- -	129,046	232,684	+\$103,638
Transfers as shown in budget schedules .....	662,500	14,411	30,754	(1) + 16,343
Unobligated balance .....	9,394	- -	- -	- -
Total obligations .....	11,622,688	11,179,457	11,283,095	+103,638
1939 appropriation obligated in 1941.....	- 72,688	- -	- -	- -
Total .....	11,550,000	11,179,457	11,283,095	+107,638





## DECREASE

(1) A decrease of \$16,343 has been indicated in Project 9, "Land use management," to offset the transfer of this amount in 1943 to the Solicitor's Office, for secretarial and other miscellaneous expenses necessary to the legal work arising out of national forest programs.

## CHANGE IN LANGUAGE

The estimates include a proposed change in language of this item as follows:

.....Provided, That [\$200 of] this appropriation shall be available for the expenses of properly caring for the graves of [fire fighters buried at Wallace, Idaho; Newport, Washington; and Saint Maries, Idaho] persons who have lost their lives as a result of fighting fires while employed by the Forest Service.....

This recommendation divides itself into two parts: (1) the limitation of \$200, and (2) the designation of the towns in which fire fighters' graves are located.

The limitation of \$200 on expenditures adds a substantial amount of accounting work in several agencies, because the authorization of \$200 must be accounted for in the same manner that individual appropriation records are maintained. This means that separate records are kept in the Treasury Department, General Accounting Office, Secretary's Office of the Department of Agriculture, in the Chief's Office of the Forest Service, and in the field. The limitation on expenditures is believed to be unnecessary since expenditures for this purpose are nominal in amount as shown by the record by the past five years as follows:

1937 - \$144	1940 - \$174
1938 - 200	1941 - 150
1939 - 200	

The change in language will permit the expenditure of funds at points other than those now named in the proviso. Fire fighters, whose bodies were not claimed by relatives, have been buried at Weaverville, California, and LaGrande, Oregon, and the Federal Government should provide for the proper maintenance of these graves. Other deaths probably will occur in the future and the proper maintenance of such graves will be facilitated if the Forest Service is authorized to take the necessary action without seeking specific Congressional authorization each time.

In recent years the bodies of very few men who lost their lives in fighting forest fires have been unclaimed by relatives. Written contracts of employment, which provide a space for recording the name and address of the nearest relative of the employee, are required in all cases. This procedure was not followed in 1910 when most of the fire fighters whose graves are being cared for by the Government lost their lives.





## WORK UNDER THIS APPROPRIATION

General: This appropriation covers all activities relating to the administration, protection and development of the national forests except the special appropriations for roads, trails, white pine blister rust, acquisition, and emergency fire suppression.

Objective: To manage, protect and develop the national forests and to utilize their timber, water, range, recreation, wildlife and other resources in such manner as will render the greatest possible service to the Nation as a whole.

Problem: Within the national forest boundaries is an area of 228 million acres, of which 177,652,000 acres are in Government ownership. Geographically, this area which is equivalent to one acre in each ten in the continental U. S., reaches into 40 States, Alaska, and Puerto Rico. Many tracts of privately-owned lands are interspersed within the Federal holdings.

The protection and management of so vast an area presents difficulties and complexities not commonly found in many other governmental undertakings. National Forests are managed under the multiple use principle. This means that practically all areas are used for, or serve, more than one purpose or objective. For example, 50 percent of the area within the National Forests of the continental U. S. serves five different purposes, viz., timber production, watershed protection, forage production, wildlife production and recreation. An additional 28 percent serves four different purposes in varying combinations. An additional 21% serves three purposes. This leaves only one percent of the total which is reserved for one purpose exclusively, mainly, special use areas such as summer home sites, pastures, corrals, etc.

The above paragraph clearly demonstrates the necessity of careful planning in the management of the National Forests, and brings into focus the interests which continually conflict and which must be reconciled by the managers of the national forest properties.

The protection of National Forests from fire, insects, disease and trespass is made difficult by the large area to be protected, the general inaccessibility of the National Forests, the many thousands of miles of exterior boundary, and the impossibility of taking preventive action when dealing with such a problem as lightning-caused fires (8902 in the calendar year 1940).

Significance: The following is indicative of the economic importance of the national forests:

- (a) The area within the national forest boundaries is equivalent to some 10 percent of the area of the continental United States.
- (b) Sales and permits were granted for the cutting of more than two billion feet of timber from the forests in the fiscal year 1941.



- (c) They produced a cash income to the Federal treasury in excess of six and one-half million dollars in 1941 from the sale of timber products, grazing, and land rentals.
- (d) They provide recreational opportunities to more than thirty million visitors annually. These people are estimated to spend more than \$200,000,000 during their trips to the forests.
- (e) They provide range for over 12 million head of domestic livestock.
- (f) Nearly 4,000,000 people who live in and near the national forests are supported in whole or in part through the management and utilization of them and their resources.
- (g) They provide watershed protection of municipal water supplies for cities and towns with a total population of approximately 6,000,000 as well as water supplies which are immensely valuable to agricultural interests.
- (h) They provide a habitat for a large majority of the big game animals of the country, and for millions of small game animals, birds, and fur-bearers.
- (i) They provide a measure of assurance of a future timber supply. At present only 2,000,000,000 feet out of an estimated allowable cut of 6,500,000,000 feet are being removed from the national forests.
- (j) They provide areas of land in large blocks already in Government ownership which are now being used for military purposes. Witness the transfer to the War Department of the Choctawhatchee National Forest, Florida, and the exclusive use by that Department of large areas of national forest land in Mississippi, Missouri, and California. In addition, many National Forests have been used for maneuvers and for special military training projects.

Plan of work: To facilitate administration, the national forest area is divided into 10 regions, 146 national forest administrative units, with 766 ranger districts averaging approximately 300,000 acres in size, or 7-1/2 times the area of the District of Columbia. The personnel of the basic organization, which is charged with the field administration and general operation of these geographical units, is also responsible for the protection of the national forests from fire, insect and tree-disease epidemics, and trespass, and for the integration of their management with economic and social problems of both national and local scope, in order that the natural resources of the national forests will contribute as fully as possible to the solution of such major problems as the production of needed timber and other forest products, utilization of forage without injury to the vegetative cover, flood control in major and minor watersheds, demands for outdoor recreation by millions of people, the permanency and continued prosperity of dependent communities, national defense, etc. The members of this basic organization manage all activities



on their respective geographical units regardless of the appropriation from which financed.

This basic organization is supplemented by fire guards and lookouts during the fire season; by temporary laborers on insect control, planting, maintenance, construction, and survey projects; by cruisers, scalers, and lumbermen engaged in timber activities; and by the year-long technicians which are necessary for the proper handling of functional activities such as fire control, timber sales, range management, reforestation, etc.

Examples of progress and current programs:

Project 1. General management, operation and regulation of national forest properties, including enforcement of Federal laws and regulations applicable to the national forests.

This project was established for the primary purpose of showing the cost of the basic (skeleton) forest and ranger district organization, the members of which are directly responsible for all programs on their respective units. This means that they must constantly adjust their programs of work to meet the various pressures which are brought to bear by Congressional action; economic conditions which bring about, as at present, a very strong demand for national forest timber and other forest resources; emergencies, such as forest fires and insect epidemics, and shifts in population. No changes occurred in 1941 in the number of forest supervisor or ranger district units, despite the fact that 1,150,000 acres of land were added to the national forests during the year.

Project 2. Maintenance of improvements other than roads and trails.

	<u>Miles or No.</u>
Telephone lines	64,633
Firebreaks	11,315
Lookout houses, towers & observatories	3,256
Airplane landing fields	76
Dwellings, headquarters	1,194
Dwellings, temporary stations	2,441
Barns, garages, and warehouses	3,337
Offices, headquarters	534
Offices, temporary stations	273
Fences, other than range	4,758
Water development projects	2,350
Public Service:	
Campgrounds	2,500
Picnic areas	650
Camp and Picnic areas	1,521
Swimming areas	208
Winter sports areas	258





	<u>Miles or No.</u>
Range:	
Fences	21,473
Corrals	750
Stock driveways	6,123
Bridges	953
Water development projects	12,516

The above table does not include the thousands of small buildings, such as woodsheds, rootcellars, tool caches, and other outbuildings for which annual maintenance charges per building are small. Neither does it include the wide range of miscellaneous projects which are comparatively small in number within the individual classes. Examples of such improvements are dams, power lines, power plants, stream improvements, docks, "bump sets," rearing ponds, etc.

Although maintenance in all cases during 1941 has not been to a satisfactory standard, with the assistance of CCC and other emergency allocations many of the improvements have been maintained in usable condition. Many others are urgently in need of repair.

Project 3. Forest fire control including prevention of fires and maintenance of a detection and "smokechaser" organization.

Forest fire control and its related fire prevention work is an activity in which success is represented by the smallest number of fires, lowest acreages burned, and lowest fire fighting costs. Fire control is a struggle to more effectively prevent and control fires against increasing numbers of forest users and recurrent adverse climatic conditions. Weather conditions, including lightning, may entirely change one year's fire suppression results from those of the previous year. During CY 1940 the total number of fires increased from 15,824 in 1939 to 17,053. Man-caused fires decreased from 8,555 to 8,151 and the total area burned inside of national forest boundaries dropped from 355,933 acres to 295,068 acres. Both the total number of fires and the acreage burned in 1940 are above the average in those categories for the five-year period 1935-1939, which were 13,709 fires and 259,973 acres. During CY 1941 the total number of fires on national forests probably will be less than 12,000.

The following are examples of progress and type of program: The 40-men crew was originated in Region 6 (Oregon and Washington) as a mobile, self-contained crew especially selected and trained in use of the "One-Lick Method" of progressive fire line construction. Both the 40-man crew concept of organization and the "one-lick" technique of line construction have been accepted as a sound management plan and have spread to other regions, with modifications to meet local conditions.

Continuing work is being carried on in the use of parachutes to transport skilled fire fighters from airplanes to forest fires in isolated locations difficult to reach by other means. During the summer of 1941 developments were made in techniques and administration. A combination of the parachute and the 40-man crew ideas has been experimented with and results encourage further work in that direction. The endeavor is to use trucks and airplane transportation of personnel in the situations for which each is best adapted.





During CY 1941 considerable effort has been expended in the preparation of forest fire prevention and suppression plans to meet the threats to national defense which may arise through the actions of saboteurs or an enemy nation. This has involved surveys and plans for aircraft warning communication nets in cooperation with Army; planning for fire defense of strategic areas in cooperation with Office of Civilian Defense, the Department of Agriculture, as well as plans more local in nature, and employment, equipping and training of emergency personnel.

Project 4. Control of tree-destroying insects and rodents on the national forests.

During fiscal year 1941, the work under this appropriation was confined to the control of forest insect pests in western national forests. Practically all of the work was done in an effort to control infestations of several species of bark beetles.

Altogether 61,441 trees were treated on 453,583 acres. The total cost of the work was \$221,447, including emergency funds, or an average of \$3.60 per tree. Both CCC and WPA labor were used on this work to the full extent of their availability in the localities where the work was required.

The most serious outbreak occurred in Wasatch National Forest in northeastern Utah. Treatment of 33,000 trees checked, but did not completely control this infestation of the mountain pine beetle which occurred in extensive lodgepole pine stands located in rough terrain at high elevations.

A new development during the year was the extensive administrative trial of a new control method developed by the Bureau of Entomology and Plant Quarantine. This method, which is a substitute for burning the infested trees, consists of cutting the trees and spraying the infested portion of the boles with a chemical which penetrates the bark and kills the insects. 1,235 lodgepole pine trees were treated by this new method at an average cost of \$2.71 per tree. Careful checks by experienced entomologists showed that highly satisfactory results had been obtained. This method has the very important advantage of eliminating the necessity for burning the infested portions of trees. Burning may be extremely hazardous from the standpoint of the possibility of forest fires, particularly toward the end of the treating season.

Project 5. Timber and forest products sales, free and administrative timber use, timber surveys, management.

The cut of national forest timber reached an all-time high in FY 1941. National defense needs for lumber and other forest products created such a demand that it was necessary to refuse applications for an estimated \$400,000 worth of timber during the early part of the year. The \$50,000 deficiency appropriation of April 1, 1941, made possible increased timber sales during the last quarter of the fiscal year and enabled preparatory work to be done for new business in FY 1942. Demand continued strong and the cut in FY 1942 is expected to show a marked increase over FY 1941.



Timber Cut in Sales and Land Exchanges

F.Y.	Timber Cut - MBM			Timber Receipts and Value		
	Sales	: Land Exchange	: Total	: Receipts	: Id. Exchange	: Total
1941	1,552,270	515,009	2,067,279	\$4,729,040	\$1,232,920	\$6,021,960
1940	1,370,996	369,275	1,740,271	3,943,373	981,901	4,924,924

Project 6. Allocation and issuance of grazing permits, supervision of range use by domestic livestock, range surveys and range management plans on national forests.

During the calendar year 1940, 33,869 permits were issued for the grazing of 1,295,825 cattle and horses, and 5,843 permits for 4,968,501 sheep and goats on approximately 80 million acres of national forest range. Receipts from this grazing use in fiscal year 1941 amounted to \$1,429,127. In handling range management and administration local forest officers attended and participated in the annual meetings of 824 small local neighborhood livestock associations and advisory boards where the details of the current season's range management plans were worked out and arrangements made for applying the plans on the ground. Such plans have now been completed for 7,000 of the 9,382 separate range allotments. These plans are based on range inventories made by men trained in the technique of range surveys. In 1940, 4,278,300 acres were covered by range surveys, making a total of about 50 million acres covered to date.

In addition to the annually recurrent effort required to handle the grazing project, field men completed a special project report covering problems incident to overgrazed areas on national forest range. This report finds that approximately 30 percent of the individual allotments still harbor overgrazed areas resulting from the grazing of too many livestock during World War No. 1 and the protracted drouth since that time; that further drastic adjustment in use of, and rehabilitation measures on, these so-called problems allotments will be needed to stop further resource destruction and to bring stocking into balance with forage production. To accomplish this will require renewed effort and increased expenditure of time on the part of the field force.

A continued effort to bring stocking into balance with forage production resulted in a four percent reduction in use in 1940 on forest ranges as a whole. Grazing trespass work decreased but still required the handling of 482 trespass cases and the collection of \$6,000 in penalties.

Project 7. Protection of the wildlife resource, preservation of forest conditions conducive to the propagation of wildlife, reduction in number of game animals in overstocked areas, wildlife surveys and management plans.

The maintenance of game animals rests on the productivity of forage on national forest lands and the maintenance of desirable populations. The economic and social significance of proper management can hardly be overemphasized in terms of the beneficial results of good management, and the terrific penalties of damage to the local communities to watersheds, soil



and vegetation, and loss of game by lack of proper management. To protect, maintain and develop the land and the wildlife resources, vigorous and continued action is required. There are many critical areas where forest resources are being damaged by over-use, especially of deer and elk, where management is necessary to maintain valuable populations of beaver and marten and to increase food and cover for all types of wildlife. To determine the amounts of use an area is capable of supporting requires men and time to do the work on the ground, and to build confidence in the public and cooperating agencies.

The increase of big game on the national forests has been at the rate which doubles in number every ten years.

Big Game on National Forests			
	<u>1939</u>	<u>1940</u>	<u>Increase</u>
Deer	1,660,000	1,810,000	150,000
Elk	144,000	154,000	10,000
Black Bear	59,000	63,000	4,000
Antelope	19,000	20,000	1,000
Mountain Goat	18,000	19,000	1,000
Bighorn	9,150	9,600	450
Moose	7,300	7,500	200
Grizzly and Alaska Brown Bear	5,200	4,800	400*(decrease)
Peccary	7,500	7,500	-
Wild Boar	<u>780</u>	<u>790</u>	10
Total	1,930,000	2,100,000	

\* Decrease due to land transferred to Glacier Bay National Monument.

This is one-third of the Nation's big game crop. There are about 6 big game animals for every square mile of the gross acreage of national forest lands. The fur-bearers total about 7,600,000, game birds about 5,500,000, and the larger predators 390,000. Fishing streams total 90,000 miles and there are 1-1/2 million acres of lakes and ponds. Each year the Forest Service aids in planting about one-fourth of a billion fish in these waters.

Difficult problems are presented on 19 forests due to over-stocking of elk, on 36 forests due to over-stocking of deer, and on 13 forests other management problems as important but not entirely due to over-stocking of deer or elk. Other uses such as timber production, recreational use, erosion and flood control are involved in these cases.

One case may be cited as being more or less typical. In Utah deer have doubled every 3 to 5 years since 1921, notwithstanding an annual buck hunt. A suggested doe kill to cure over-stocking resulted in the issuance of 1000 doe licenses. At first sportsmen opposed such a kill and purchased the first 1000 licenses without killing a doe. Last year doe hunts were held on 6 national forests and 11,173 does killed in addition to 16,827 bucks. This year there were about 23,000 doe permits sold. In other words, due to a tremendous amount of education and contact, a management approach





to protect both the herd and the forage is now under way. The same condition exists in Colorado, Oregon, Washington, and Idaho on overused deer ranges.

Project 8. Supervision of recreational use of national forests, including plans, operating, policing, enforcing state sanitary laws, and garbage disposal on public camp grounds.

Emphasis is being placed on the management of the recreation resources of the national forests which are receiving constantly increasing annual use by the public. Last year national forests and national forest recreation facilities received over 16 million visits, totalling over 42 million days of use. Five years ago this use was only 10 million visits and, if present indications are reliable, future use will increase in similar proportion. Public use on the national forests is the result of easy accessibility by automobile and a desire by the public to get into forested mountain areas for forest type recreation and climatic relief. This public use is forced upon the Forest Service; it cannot be disregarded and it cannot be accommodated without the construction of recreation areas, including facilities such as tables, grates, shelters, bathhouses, and sanitation and fire prevention measures. Public use of such volume if not managed to some extent would result in damage and destruction to established recreation areas and to the national forests, unsanitary conditions dangerous to users of the national forests and the many towns which obtain their domestic water supplies from the forests, and disappointment to the recreation users. Forest rangers and forest guards under the general direction of the forest supervisor and regional office personnel supervise the annual use of some 8-1/2 million people, totalling 17 million days of use on 42 hundred public camp and picnic areas, keep these areas clean, prevent destruction of government property, pollution of streams, and injury to the users.

Supervision of these public camp and picnic areas is becoming increasingly difficult with the reduction in CCC and WPA funds and personnel with which much of this work has been done in the past. Since the public demand for forest recreation cannot be disregarded, it must be met by hiring guards from regular appropriations. Closing the national forests to recreation use is the only other solution, and that is considered inadvisable, in fact, impossible considering the public demand.

On 254 winter sports areas the activities of 1-1/2 million people are supervised, safety patrols are organized, and warnings of slide danger and approaching dangerous weather conditions are posted. General supervision is also given to the activities of some 3 million visitors scattered all over the national forests for hunting, fishing, and hiking, and some 3 million visitors to the 2 hundred resorts and 13 thousand summer homes located on national forest lands.

Organization camps constructed primarily for the use of low income groups are receiving special attention and arrangements are made to have civic groups and organizations sponsor low cost vacations at these well equipped forest camps.





In all this work forest officers have as an over-all objective allowing the recreationists as much freedom of movement and enjoyment as is consistent with the safety of the public and the preservation of the national forest properties.

Constant attention is also given to integrating this large recreation use with the other uses for which the national forests were established and in planning for the development of additional recreation areas as are needed to meet the growing public demands.

Project 9. Land use management on national forests, including rental of land; land classification; action on claims entered under public land laws; location and posting of national forest boundaries; general surveys, plans and maps; aerial photography; land exchange.

There are in existence 43,097 special use permits, yielding an annual revenue of \$383,494.30. Last year 6,710 such permits were issued and 5,832 existing permits were terminated. Many of these permits are for public use, such as resorts, organization camps, ski lifts, and others contribute to the economic life of individuals and communities, such as pastures and sawmills. Emphasis is being placed on the supervision of all special uses so that they may be integrated with the management of the national forests in order to allow these lands to contribute the maximum to public use, economic welfare and personal enjoyment without detriment to the national forest properties and the general public interest. Applications for new special use permits are examined carefully to determine that the use is consistent with national forest management objectives and existing uses are examined periodically to check on compliance with the terms of the permit and to guard against present or potential damage to the national forests or the public.

During the last year a procedure was developed for leasing of oil and gas resources under the jurisdiction of the Department of Agriculture and one advertisement has already been made covering 900 acres of national forest land in Michigan, and other applications involving several thousands of acres are pending. The management of oil and gas leases will require active cooperation with the Geological Survey in the technical field of oil and gas development.

The management of land classification activities required the classification of 75 parcels of land last year. This work requires classification of lands in accordance with the act of June 11, 1906, as to whether or not the land is primarily valuable for agriculture.

During the past year examination and report was made on 27 homestead claims. Two hearings were held, twenty-four new claims were received, twelve pending from the previous year and nine carried over to the new year. In the same period examination and report was made on 105 mineral claims. Eleven hearings were held, 147 new claims were received, fifty-four pending from the previous year and ninety-six carried over to the new year.



Accurate maps are essential for adequate and efficient protection, development, and administration of land and resources. These are generally prepared from aerial pictures which serve not only for map production but a variety of activities such as fire control, range surveys, determination of the distribution and density of timber and many other purposes. Aerial photographic coverage of 21,865 miles was obtained during the year. Planimetric maps were prepared from pictures for 19,030 square miles. Topographic maps made by ground methods totaled 638 square miles. These maps conform to standards of the Federal Board of Surveys and Maps and are published on scales of 1/4, 1/2, and 1 inch to the mile. Fifty-nine maps were published, of which 28 were on 1/4-inch scale, 25 on 1/2 inch and 6 on 1-inch scale.

During the fiscal year 1941, 172 exchange cases were consummated. The Government received 290,842 acres of land appraised at \$1,853,072 in exchange for 50,154 acres of land valued at \$175,255 and \$1,052,072 worth of national forest stumpage.

Of the 2,375 families found on land acquired in the East for National Forest purposes, some 1,400 are impoverished and in need of rehabilitation assistance.

The rehabilitation of these families has been given added impetus by setting up projects coordinately with the Bureau of Agricultural Economics, Farm Security Administration and Soil Conservation Service, and using CCC and WPA labor wherever possible. Serious attempts are being made in northern Wisconsin, southern Missouri and eastern Kentucky to build a durable economic base of farm crop land and woods work and stock raising, underneath some of the most impoverished communities. These joint projects, which usually include one to five counties, employ the available resources of the other agencies within the Department as added to by emergency work program agencies. State cooperation is usually obtained. The restoration of the timber values is an important factor as well as the rehabilitation assistance furnished by the Farm Security Administration. The problem is one involving a high population pressure with wholly inadequate support opportunities. National Forest land management is being directed toward increased support through small timber sales, increased forage production for livestock, and maximum crop production on the small agricultural tracts available.

The maximum permanent economic support from the land resources is the aim of these projects.

#### Project 10. Protection, development, and management of the water resources of the national forests.

An inventory of erosion problems was completed in one region, bringing the total to four regions in which the study has been completed since 1939. Three additional regions have accomplished the major part of the job in the past year.

Emergency treatment of a large burned area in southern California to prevent potential flood damage was accomplished through the combined use of regular, flood control and relief funds. Other small burned areas were given emergency treatment.



The major new undertaking of the year was the initiation of a program of erosion and run-off control in the Los Angeles River watershed under the Flood Control Acts. An expenditure of Flood Control funds in amount of \$1,170,500 is contemplated in a two-year period. Approximately \$32,000 was expended in fiscal year 1941 for necessary engineering investigations, plans and designs, and the initiation of construction.

Using data which are obtainable from Forest Service records and elsewhere, in two regions, inventories of water uses and national forest water resources are being accumulated. The object of this work is to provide information for developing the relative economic values of national forest lands for production and control of the water resource. Information has been compiled and furnished to public agencies concerning the number and extent of water improvements on the national forests.

Recent inspection of certain areas in the Southwest, five years ago severely eroding, has revealed greatly improved watershed conditions as a result of land purchase, followed by control of land use supplemented by mechanical erosion control devices. In certain other areas a planned program of water resource control and use has been initiated to provide annually both improved habitat for water fowl and increased grazing capacity for domestic stock within the same land areas.

The annual production of about 500,000 grass, shrub and tree plants at two erosion control range plant nurseries in New Mexico and Arizona has been continuing for several years, largely supported by CCC labor, of which 2600 man-days were required in fiscal year 1941.

In the Southwest, sixteen cooperative agreements have been entered into with the Soil Conservation Service covering soil conservation practices on intermingled private and national forest lands. Included in agreements were 234,455 acres of national forest lands.

For use in land management planning, inventories and maps of municipal and industrial watersheds of the northeastern national forests were completed.

Participated with the Soil Conservation Service and Extension Service of the U. S. Department of Agriculture in a cooperative survey and preparation of plans for Wellsville Mountain, Utah, an area in which 16 communities are vitally concerned.

#### Project 11. Construction of improvements other than roads and trails.

With minor exceptions, the funds expended under this appropriation have been used to supplement CCC and other emergency funds. With the reduction of the CCC camp program and the curtailment of other emergency work programs, it becomes increasingly difficult to maintain a construction program that will meet both administrative and public needs, and administrative officers must be constantly on the alert to discover means of accomplishing the necessary work with expenditure of a minimum of funds under the appropriation.





Project 12. Reforestation of denuded national forest land.

In the calendar year 1940, tree planting reduced the area of nonproductive and barren lands by 147,102 acres at an average cost of \$11.84 per acre. To produce the 145,855,000 seedlings and transplants used in planting this acreage, twenty-six forest tree nurseries were operated. In addition to planting trees, 4,230 acres were sown with 19,245 pounds of tree seed.

The objective is to restore to productivity, areas on the national forests which have been devastated by fire, unregulated cutting, or unwise agricultural use. There are about three million acres remaining to be planted. Without considering additions to this acreage by land purchase and other factors, the present rate of planting will, if maintained, require twenty years to plant the area now classed as in need of planting.

National Planting Program

Location	Area planted in 1940 Acres	Thousand Trees	Seeded Direct	Net total Acres planted and seeded to date	Area remaining to be planted Acres
			1940 Acres		
West of Great Plains	28,828	20,086	4,050	240,063	961,398
East of Great Plains	118,274	125,769	180	727,332	2,034,537
Total	147,102	145,855	4,230	1,027,395	2,995,935

Project 13. Hazard reduction, fire prevention, and timber use, White Mountain National Forest.

The special program provided by a \$500,000 deficiency appropriation in the fiscal year 1939, following the disastrous New England hurricane of September 1938, was discontinued on June 30, 1941. While the fire hazard resulting from the windthrown timber is higher than normal in this area and will continue at a high level for several years, the additional expenditures to meet this condition are being absorbed by the National Forest Protection and Management appropriation as a part of the regular protection program.



National Forest Statistics

	<u>Gross</u>	<u>Net</u>
All national forests .....	228,300,297 acres	177,652,648 acres
Average for each of 10 national forest regions .....	22,830,930 "	17,765,265 "
Average for each of 146 national forests .....	1,563,762 "	1,216,799 "
Average for each of 766 ranger districts .....	298,054 "	231,923 "
Estimated expenditures per acre from P&M (1942) .....	4.84¢ per "	6.22¢ per "

Estimated expenditures in 1942 from P&M by administrative units:

Expenditures

Average for each of 10 national forest regions .....	\$1,105,041
Average for each of 146 national forests .....	75,688
Average for each of 766 ranger districts .....	14,423
Amount for area equivalent in size to land area of District of Columbia (39,680 acres) .....	2,469

Timber resource:

Estimated volume of timber on national forests .....	552,000,000,000 ft.
Annual allowable cut 1941 .....	6,579,020,000 "
Actual cut fiscal year 1941 .....	2,351,000,000 "



SUPPLEMENTAL FUNDS

Direct Allotments

Projects	Allotments, 1941	Estimated allotments, 1942
<u>Emergency Relief, Agriculture, Forest Service</u> (Transfer from W.P.A.): For conservation of forest resources, surveys and mapping and developments of camp grounds under "National forest protection and management" as follows:		
Maintenance of improvements other than roads and trails (Includes telephone lines, fences, lookout towers and observatories, fire breaks, offices, barns, garages, dwellings, outhouses, water developments, pipe lines, public camp grounds, landing fields, etc.) .....	\$264,494	\$40,700
Forest fire control, including prevention of fires and maintenance of a detection and "smokechaser" organization .....	102,774	15,000
Control of tree-destroying insects and rodents on national forests .....	35,042	12,460
Timber and forest products sales, free and administrative timber use, timber surveys, management plans, and timber stand improvement.	41,526	5,000
Allocation and issuance of grazing permits, supervision of range use by domestic livestock, range surveys and range management plans on national forests .....	12,192	- -
Supervision of recreational use of national forests, including plans, operating, policing, enforcing State sanitary laws, and garbage disposal on public camp grounds .....	6,562	- -
Land use management on national forests, including rental of land; land classification; action on claims entered under public land laws; location and posting of national forest boundaries; general surveys, plans and maps, aerial photography; land exchange .....	16,017	5,900
Construction of improvements other than roads and trails (Includes telephone lines, fences, lookout towers and observatories, fire breaks, offices, barns, garages, dwellings, outhouses, water developments, pipe lines, public camp grounds, landing fields, etc.) .....	1,117,814	93,797
Reforestation of denuded national forest areas .	157,377	46,077
Total for foregoing projects.....	1,753,398	221,934
Administrative funds included above.....	23,692	2,957
Total, Supplemental funds (direct allotments)...	1,730,206	218,977





(c) RECONSTRUCTION AND REPAIR OF ROADS AND OTHER  
IMPROVEMENTS, NATIONAL FORESTS IN CALIFORNIA

Under the above title an appropriation of \$200,000 was provided by the Second Deficiency Appropriation Act, 1940 (approved June 27, 1940) for the reconstruction and repair of flood-damaged roads and other improvements on California National Forests. The entire appropriation was obligated during the fiscal year 1941.

(d) RECONSTRUCTION AND REPAIR OF ROADS AND OTHER  
IMPROVEMENTS, NATIONAL FORESTS IN GEORGIA  
NORTH CAROLINA, SOUTH CAROLINA, AND TENNESSEE

Under the above title an appropriation of \$125,000 was provided by the First Supplemental Civil Functions Appropriations Act, 1941, (approved October 9, 1940) for the reconstruction and repair of flood-damaged roads and other improvements in National Forests of Georgia, North Carolina, South Carolina, and Tennessee. Of the appropriation of \$125,000 a total of \$122,984 was obligated in the fiscal year 1941.



(e) WATER RIGHTS

Appropriation Act, 1942 .....	\$20,000
Budget estimate, 1943 .....	<u>20,000</u>
Change from 1942 .....	<u>- -</u>

PROJECT STATEMENT

Project	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Investigation and establishment of water rights .....	\$ 18,958	\$ 20,000	\$ 20,000	- -
2. Net cost of within-grade promotions	- -	- -	- -	- -
Unobligated balance .....	1,042	- -	- -	- -
Total .....	20,000	20,000	20,000	- -

WORK UNDER THIS APPROPRIATION

**Objective:** To secure and to assure protection of the right of the Government to divert and use water necessary to the administration, development, and utilization of the national forests; also, as soon as possible, to establish Federal ownership of as much water as is essential to the full use and management of the national forests.

**The problem and its significance:** Except in the States operating fully under the riparian system for diverting and utilizing the natural flow in streams or of storing such in reservoirs, an appropriate State agency decides the individual company or agency which shall have the right to divert or store water, the amount of water, the purpose of use, and the place of diversion or of storage. Prior to securing an "adjudicated right" or "decree" to the water, a survey must have been made, an application filed, such fees as required paid, and a permit secured authorizing the diversion or storage of not exceeding a specified amount of water. Actual use for the approved purpose during a certain period of time is required before a claim can be made for an adjudication or a decree covering the amount of water which has been actually diverted or stored and for the approved purpose. In the event, however, that the water of a stream previously has been entirely "appropriated", a right to use can be secured only by purchasing an earlier water right either separately or with the land itself.

The Forest Service uses water for ranger stations and other administrative areas, forest nurseries, public campgrounds and other recreation areas, lakes, swimming pools, fire protection, stock watering ponds, impoundments for flood and erosion control work, miscellaneous water supplies, and in other ways. The number of uses is very great, but the amount of an individual diversion or storage is usually very small.



An uncontestable right to the use of the required amount of water is essential to the purpose of the activity or project upon or for which used. Accordingly, immediate action by the Federal Government was necessary to protect past investments and to make certain of adequate water supplies for current projects and those definitely planned in the future.

Plan of work: Since all necessary work could not be financed from the appropriation for one or several years, attention was first given to uses on streams in the Rio Grande, Colorado, and other drainages where the amount of water available for appropriation and use is approaching exhaustion. Also first attention was given to those cases where the unit cost was the least, thereby securing the maximum amount of protection from the Federal expenditure. Usually postponed were the cases where the unit cost per water right was high, whether secured by the filing method or, and particularly, securing by purchase of an existing right granted to some other agency or to an individual.

Progress and current programs: From July 1, 1936 to June 30, 1941, total expenditures were \$76,471, and approximately 1600 filings were made. It is estimated that \$80,000 will be required to complete the project after June 30, 1942.

(f) FIGHTING FOREST FIRES

Appropriation Act, 1942 .....	\$100,000
Budget estimate, 1943 .....	<u>100,000</u>
Change from 1942 .....	<u>- -</u>

PROJECT STATEMENT

Project	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
Fire suppression .....	\$3,196,693	\$67,000	\$67,000	- -
Protection of unappropriated public forest lands .....	107,906	33,000	33,000	- -
1941 appropriation obligated in 1940 .....	+ 94,098	- -	- -	- -
unobligated balance .....	181,303	- -	- -	- -
Total .....	3,580,000	100,000	100,000	- -

WORK UNDER THIS APPROPRIATION

Because of the impossibility of predicting in advance what expenditures will be necessary in suppressing forest fires, Congress has for 30 years followed the practice of appropriating only a nominal sum in the annual appropriation act. Supplemental estimates are submitted after the close of the summer fire season for expenditures actually incurred in excess of the regular appropriation, plus an estimated amount for the period remaining in the fiscal year.





1. Fire Suppression. This project covers emergency fire control expenditures in connection with the suppression of forest fires on the national forests. Administrative restrictions placed upon the use of these funds by the Forest Service provide that expenditures shall not be made therefrom until forest fires have actually started. An exception is made to this rule, however, when fire conditions become so critical that the regular protective organization, which is financed from the appropriation "National Forest Protection and Management", is unable to cope with the situation and when, therefore, the temporary employment of additional guards clearly will reduce expenditures for fire fighting.

Expenditures are made for the employment of fire fighters and their transportation, and for equipment needed on going fires when not available in stocks of equipment previously purchased. Expenditures are made for the travel expenses of forest guards when going to or returning from fires and for the travel expenses of regular employees of the Forest Service when the travel extends beyond the boundaries of the units to which they are regularly assigned, or when the activities to which men are regularly assigned do not include fire fighting.

2. Protection of Unappropriated Forest Lands. Unappropriated public forest lands are widely scattered throughout the entire West. In many cases protective associations, organized to protect privately owned lands, and certain states were compelled, prior to fiscal year 1938, to protect the public forest lands intermingled with the private lands. Under cooperative arrangements which have been worked out between the Forest Service and the timber protective associations and States, the Federal Government now bears its fair share of the cost of protecting these public lands. The accounts of these cooperatives are audited by the Forest Service and the per acre cost of protecting the public forest land is based upon a total figure from which all improvement and development expenses have been eliminated.



TO NOVEMBER 10, CALENDAR YEAR 1941

(Fire season not yet closed)

NUMBER OF FIRES					: AREA BURNED - ACRES			: EXPENDITURES	
A	B	C	D	E	Man	Light-	National	Private	:
Re-	(1/4 A. (.26 to	(10-99.9	(100-299	(300 A.	caused	ning	Forest	land	:
gion or less)	9.9 A.)	acres)	acres)	or over)	Total		land	inside	Total
1	1199	19	2	..	1329	132	592	93	685
2	200	1	..	..	247	81	63	11	74
3	818	6	..	1	978	131	1026	71	1097
4	415	29	11	8	533	138	1876	913	2789
5	1123	71	23	42	1613	766	77587	7763	85350
6	1824	47	17	17	2157	226	11558	2331	13889
7	77	129	18	11	502	474	5795	5558	11353
8	216	588	126	51	1902	1762	80193	19064	99257
9	479	375	52	22	2251	2195	25311	16205	41516
10	25	..	..	..	24	67	13	..	13
Total	6376	1265	249	152	11546	5972	204014	52009	256023
					\$1,609,450				
					Estimated National Forests, Nov. 11 to Dec. 31, 1941				
					Spring Expenditures National Forests				
					Expenditures for protection of unappropriated public forest lands July 1, 1941 - December 31, 1941				
					Expenditures for protection of unappropriated public forest lands January 1 to June 30, 1942				
					Total				
					\$ 2,179,823				



(g) PRIVATE FORESTRY COOPERATION

Appropriation Act, 1942, plus  
 \$1,370 supplemental for within-  
 grade promotions ..... \$100,928  
 Proposed transfers in 1943 estimates:  
 From "Salaries and expenses,  
 general administrative expenses" ..... + 12,138(1)  
 Total available, 1942 ..... 113,066  
 Budget estimate, 1943 ..... 114,000  
 Change from 1942:  
 Additional for administrative promotions ... + 934  
 Increase ..... + 934

(1) This consolidation of funds from the item "General administrative expenses" will permit the payment of salaries of individuals in the Division of Private Forestry Cooperation totaling \$12,138 from this appropriation, which finances the subject-matter work of the Division. This is not an increase in working funds, rather, it is a clarifying adjustment between appropriations.

PROJECT STATEMENT

Project	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Cooperation with timberland owners	\$99,347	\$111,696	\$111,696	- -
2. Net cost of within-grade promotions	- -	1,370	2,304	+ \$934
Unobligated balance .....	653	- -	- -	- -
Total .....	100,000	113,066	114,000	+ 934

WORK UNDER THIS APPROPRIATION

Objective: To increase the productivity of all privately owned forest land, so that such land will contribute what it can and should, to the permanent economic well-being of its region and to the economic and social welfare of the Nation; also so it may adequately contribute in national emergencies, through making available essential wood products in war time and providing a reservoir of productive employment in time of economic distress.





The problem and its significance: Twenty-five percent of the total land area of the United States is classified as commercial forest land. Seventy-five percent of this 462-million-acre area, and probably 90 percent from a productivity standpoint, is in private ownership. Ninety-five percent of our wood products are now cut from this private land. The best available data indicate that less than 2 percent of these lands are handled under sustained-yield with the growing stock being built up, and only 5 percent more are under sustained yield with the cut not exceeding growth, although even these lands are not fully productive. It is no coincidence that our rural areas of greatest economic distress in the recent depression were in our cutover forest areas. The wood products of our private forest land are still being depleted faster than they are being replaced by growth, and this is especially true of our high value sawtimber, which is being consumed 50 percent faster than it is growing. Continuation of this situation will result in the economic ruin, at an accelerated rate, of many forest areas and communities, and the serious depletion of the Nation's forest resources in terms of productive acreage.

Lack of proper technical advice and the absence of carefully prepared management plans are largely responsible for the destructive cutting of the bulk of the Nation's best forests, leaving them in a depleted and unproductive condition--a public liability for decades to come. The technical knowledge of the Forest Service, gained through years of intensive and exhaustive research, and its intimate knowledge of the conditions and problems of each forest region, must be made available to cooperators. Adequate contacts have to date been possible with probably less than 1 percent of the 4,500,000 forest land owners in the Nation.

In some sections of the country, as in parts of the South, farm woodlands are an integral part of the general economy of the region and should be managed under a coordinated plan which takes into account all forest lands in the area. Forest industries are, in part, dependent upon the farm woodlands and in turn the farmers and the communities are entirely dependent upon permanent operation of the wood-using industries. In such cases it is not enough to manage each farm woodlot as a separate piece of property. Advice and technical assistance to the individual owners should be based on a thorough knowledge of the forest economy of the entire area in question. This is a field entirely beyond the usual type of farm forestry extension as now carried on and requires the services of highly trained and experienced specialists. It embraces a type of cooperative effort which is urgently needed in working out sustained yield management plans for forest regions and communities dependent upon forest products.

The present national defense emergency has greatly increased the demand for wood products, especially lumber and pulpwood. Ever increasing new uses for wood products, especially various forms of wood cellulose, have emphasized the vital importance of adequate forest products for emergency needs.



The work in general falls under four phases, namely, (1) industrial, (2) small forest or woodland projects, (3) forest products cooperatives, and (4) miscellaneous.

1. Industrial:

Members of the Division contacted approximately 300 of the lumber and pulpwood companies in the Nation. When any material investment of public funds was made in such cooperative work with an industrial operator or land owner, the work was done on a cooperative and demonstration basis with the company or owner usually contributing at least half the cost and personnel. The personnel contributed by the cooperator were trained so they might carry on the work and permit active participation by the public, to be withdrawn as soon as possible. In over half of the projects where case studies and recommendations were made the owners have placed these recommendations, with relatively little modification, into effect with resultant major benefits to themselves and to the public interests involved. The Division was not able to handle all the requests for cooperative work received during the year, and has been able to contact and cooperate with only a small percentage of the industrial forest owners and operators with whom it should cooperate.

2. Small forest or woodland projects:

A large number of contacts were made with the owners of small forest areas or woodlands located in the forest-land management unit areas. The resultant cooperative work usually consisted of advice on marking, utilization, and marketing wood products, leading to the gradual application of sustained yield management principles on all private forest land of the management unit area.

3. Forest products cooperatives:

The Division, during the year, participated in initiating and maintaining ten forest products cooperative associations located in the Eastern States from New Hampshire to Louisiana. Membership in these cooperatives is composed primarily of owners of small forest acreages. The Division's growing experience with these cooperatives and their cutting, utilization, marketing, and administrative problems will be invaluable. Forest product cooperative management and marketing associations may, and should be, a major factor in helping the average forest-land owner to produce and market his forest products on a permanent basis with fair market prices and resultant major benefits to himself and his community.

4. Miscellaneous:

The Division continued supervision and administration of the naval stores agricultural conservation programs for the AAA. This job included the inspection of conservation practices of 2,800 participants involving net benefit payments totaling \$1,110,000. The Division participated in many county land-planning projects, in which it presented data and advice relative to the forest land and resources involved. It held training schools for representatives of State Forest Services. At the request of local officials, it made county and State-wide analyses and plans relative to obtaining improved management and use of forest land and resources.



Forest Research Funds

(g) FOREST MANAGEMENT INVESTIGATIONS

Appropriation Act 1942 plus \$6,712	
supplemental for within-grade	
promotions .....	\$611,712
Budget estimate, 1943 .....	<u>566,500</u>
Changes from 1942:	
Reduction in working funds .....	-55,000
Additional for administrative	
promotions .....	+ 9,788
Net decrease .....	<u>-45,212</u>

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Silvicultural investigations	\$269,904	\$269,776	\$214,776	-\$55,000 (1)
2. Mensuration investigations .	55,022	50,592	50,592	- -
3. Forest regeneration investigations .....	91,207	92,397	92,397	- -
4. Fire protection investi- gations .....	107,617	107,950	107,950	- -
5. Naval stores investigations.	15,388	18,980	18,980	- -
6. Forest genetics investi- gations .....	63,861	65,305	65,305	- -
7. Net cost of within-grade promotions .....	- -	6,712	16,500	+ 9,788
Unobligated balance .....	2,001	- -	- -	- -
Total appropriation .....	605,000	611,712	566,500	-45,212

DECREASE

(1) The decrease of \$55,000 in silvicultural investigations will be met largely by reduction of force, both permanent employees and temporary service, together with reduction in facilitating services.

WORK UNDER THIS APPROPRIATION

Objective: To supply the facts on which to base sound forest practice. Specifically, to provide the information needed by Federal, State, and private agencies to reforest, protect from fire, improve, and manage forest lands for efficient and permanent production of sawlogs, pulpwood, fuel, and all other forest products; and to maintain forest cover where needed for recreation, watershed protection, and wildlife.





The problem and its significance: There are 630 million acres of forest lands in the United States, of which 462 million are capable of producing commercial timber crops. Extending 2,800 miles east and west, 1,600 miles north and south, and from sea level to over 10,000 feet in elevation, forested lands are extremely diverse in character. There are over 50 important forest types and 180 commercial tree species to be dealt with.

Repeated and unwise cutting, uncontrolled fire, and in some areas unrestricted grazing has reduced many million acres of forest land to a low state of productivity. Some 77,000,000 acres are now practically unproductive and another 71,000,000 acres, much of which is inadequately stocked, bears trees yet too small for saw timber. Much of the 314 million acres bearing saw timber or cordwood stands has been cut and culled over repeatedly and is of low productivity.

Restoration of these cutover and depleted lands to useful productivity is a most critical problem and will become more so after the war. Then, the abnormal and destructive industrial stimulation of armaments, that temporarily relieves and eclipses rural poverty problems, must be in part replaced by a sounder but slower development of natural resources. Many people will be thrown back on the land, and without restorative action the vicious circle of depleted resources engendering yet more destructive exploitation will be intensified. Yet few situations offer equal opportunity for such useful and worth-while employment as may be needed during the aftermath of the present world war.

Correction of this situation is a difficult and stubborn problem that must be attacked from many sides. One major stumbling block that cannot be sidestepped is insufficient knowledge on how to do the job most cheaply and effectively. Millions of devastated acres must yet be planted, a highly technical problem only partially solved. Fire control technics need to be improved. On large cutover and partially stocked areas, stands must be built up by cutting the least valuable and encouraging the more valuable, a job requiring an intimate and local knowledge of tree growth and requirements. A general problem that dovetails with economic and forest products research is integrating and scheduling the production of all forest products, such as fuelwood, pulpwood, stave bolts, acid wood, and saw timber to yield the greatest net income to the local dependent population.

Another general problem is development of methods of cutting stands of mature timber that are not only financially practicable but which will result in reproduction and continued productivity. The cutting of remaining virgin stands is being greatly accelerated by the present emergency, making the need for improved practices particularly urgent. Information is needed on such things as: Effect of cutting different proportions of timber stands on rate of growth of remaining trees, logging damage, windthrow, disease, sun scald, and insect attack; effect of harvest cutting methods on fire danger, and degree of slash disposal necessary; ability of different species to reproduce and grow under partially cut stands of varying density; and effective methods of improving species composition, form, and quality of young stands.





General plans: Research under this appropriation is conducted at 13 regional forest and range experiment stations. In so far as possible, work is being pointed at problems made urgent by the war situation. These include work with State and Federal agencies in development of emergency fire protection; supplying methods-of-cutting information that will make possible maximum cuts of urgently needed species with minimum permanent damage to the forest; assisting in planning post-war forest rehabilitation work and in making ready available information on how to do it; and aiding in formulation of minimum forest practice rules for regulatory measures that may become necessary.

Examples of progress and current programs:

Project 1. Silvicultural investigations:

Work under this project has already developed practical methods of harvesting, thinning, and pruning for many important forest types. During the last year work was completed on the following problems:

1. In the Lake States a comprehensive bulletin was published on how to convert low-quality aspen scrub lands to more valuable conifers. It is estimated that about 10 million acres are in need of conversion.
2. Practical information on how to cut, reproduce, and grow jack pine, another important Lake States forest type, was assembled in a bulletin now in press.
3. Light selective cuttings have been found effective in anticipating insect mortality in the East-side ponderosa pine type of California as the result of joint studies by foresters and entomologists. This type of cutting has reduced insect losses 94, 88, and 82 per cent respectively on areas cut over one, two, and three years ago. This is an important contribution to the selective cutting concept now being widely applied throughout ponderosa pine stands in the West.
4. In the western white pine type studies have shown how to integrate white pine blister rust control measures more effectively with timber management practices and how to define areas in which white pine blister rust is important. Blister rust is one of the most difficult, urgent, and expensive problems facing the western white pine region.
5. In the bottomland hardwoods of the South, desirable tree species were defined, and tentative marking rules were formulated telling which trees to cut and which to leave. Work was only recently undertaken in this large and important forest type.

Project 2. Mensuration investigations:

Sustained forest harvest from timberlands, whether in national forest, industrial, or small private ownership, depends on accurate inventories and reliable estimates of growth obtainable under different management methods. Work under this project has already supplied volume, stand, and yield tables and information on rates of growth for over one-half of the principal forest types of the United States.



Much emphasis in recent work has been given to development of methods through which research objectives could be accomplished efficiently, and into studies of timber growth particularly after partial-cutting now coming into wide use. Examples of specific studies completed during the past year are:

1. A method of estimating areas of vegetation types (necessary to determine range forage resources and effectiveness of management methods) using linear measurement sampling procedure was developed that is more economical and efficient than the usual mapping method.

2. In collaboration with Duke University, a monograph on forest sampling methods was completed during the year. Hitherto foresters have had to draw from and adapt their sampling methods from agriculture. Here for the first time is a study at a high level dealing directly with forestry problems in forestry terms. Many sampling methods of practical value in forestry are included. For example, one is a method of making sawmill studies more cheaply. Instead of laboriously following individual logs through the mill and determining individual lumber yields, a close approximation through regression analysis can be had simply by measuring logs going into the mill and lumber coming out for a short period. Another is the practical device of "double sampling." Some important variables are difficult and expensive to measure, but by correlating them with some easily measured variable, and sampling in terms of the latter, more information can often be obtained at less cost.

3. Comprehensive growth, yield, mortality, and volume tables for selectively cut ponderosa pine in the Black Hills and lodge pole pine in Colorado and Wyoming were completed and published. This information tells a timber manager how much growth can be expected from a given volume of growing stock. For example, in lodgepole pine, annual yields per acre are:

90	bd.	ft.	from	reserve	growing	stock	of	2000	bd.	ft.
128	"	"	"	"	"	"	"	4000	"	"
152	"	"	"	"	"	"	"	6000	"	"

### Project 3. Forest regeneration investigations:

This project supplies the information by which 70 to 90 million acres of land in the United States will be reforested by planting or seeding. It has already laid the basis for nursery and planting practices throughout the United States. During recent years, although much work is still being done to further cut nursery and planting costs by developing better methods, more attention is being given to such important problems as:

1. Direct seeding, long regarded as impractical. Research is showing the way to successful direct-seeding methods. During the past 3 years direct seeding has been successfully employed in the Northern Rocky Mountain, Lake States, and Appalachian regions with direct reduction of up to one-third in cost. Although the circumstances under which it can be successfully employed are still limited, there is good reason to believe that further





study will show how this method may be extended to other species and other forest regions. If this can be accomplished, it will result not only in direct savings over planting costs in many cases, but it will permit a much more flexible approach to the planting problem, permitting elimination of expensive installations in nurseries and nursery equipment now needed for the production of planting stock. In the post-war period, for example, this would permit reforestation operations to be undertaken whenever seed was available without the necessity of preparing large nurseries and spending one or more years in growing plantable stock.

2. More accurate local identification of suitable soils and sites for planting particular species is needed. The problem is made difficult by the fact that many areas have been so changed by logging, fire, or agricultural use that they no longer can support once native species. Progress is now being made in this field in the Lake States, Central States, and appalachian regions.

#### Project 4. Fire protection investigations:

Fire research has continued to pay dividends in needed information on fire detection, behavior, control, and damage. During the year a thorough, region-by-region analysis of the fire problem and research needs was made as the first step in reexamination of our fire studies program to make certain that completed work is dropped and further work realistically aimed at the most important problems. Some specific accomplishments of the year are as follows:

1. A method of fire-damage appraisal was developed giving a definite and quick dollar-per-acre estimate in tabular form of fire damage in pine and hardwood stands of the Appalachians. To apply this method, it is necessary to know only within rough limits the forest type, forest stocking, whether sawlog stand or not, and fire severity as measured by fire danger at the time of burning.

2. In the Lake States, tables were prepared giving for average condition (a) approximate rate of spread of fires by danger class, wind velocity, and fuel type; and (b) the size of crew necessary under specified conditions to control fires while small. This information gives in usable form the end result of much research, furnishing the fire dispatcher with a basis for quick estimate of how fast fires will spread and how many men must be sent to control them while small.

3. In the Pacific Northwest a partial answer to the basic question "what is adequate fire control" was given by a detailed study of the fire situation in a sample Washington county. This study will furnish information immediately useful to State and private protective agencies.

4. A haze-cutting filter was developed to extend the visual range of look-outs. Under favorable conditions this filter removes from 50 to 70 percent of atmospheric haze. This device and the principle on which it is based have been called to the attention of military authorities and will have use in that field.





5. An improved eyetest for the selection of "eagle-eyed" lookouts was developed. It is simple to apply, independent of lighting conditions, and rates the lookout's ability to see small smoke columns--the lookout's main job.

Project 5. Naval stores investigations:

During the past year experimental work on the stimulation of gum yields by chemicals was continued. Under certain conditions yields have been stepped up from 20 to 80 percent, depending on the species and chipping method, by the application of a 25 percent solution of sulphuric acid to the fresh streak.

Project 6. Forest genetics investigations:

Good progress has been made during the year in building up a large body of experimental material on promising species, races, individuals, and hybrids, from which improved trees can be selected, and in the development of methods of vegetative propagation in the necessary breeding technics.

In the Northeast, about 400,000 seeds of 11 important tree species produced through controlled pollination were collected. These seeds will be planted, and promising seedlings selected for further testing. About 2,100 maple seedlings resulting from controlled breeding were produced during the year from which to select superior individuals. Thirteen new crosses were made in an attempt to obtain a white pine immune to the blister rust. The methods involve transferring the immunity of such species as ponderosa and Jeffrey pine to white pine by crossing with an intermediate species.

It was shown that white pine cuttings can be successfully rooted under certain conditions with the aid of a 6-hour treatment with indole-butyric acid. Development of successful rooting methods is an important advance as it permits vegetative propagation of individual trees of superior quality.

A series of experiments were completed and published by the California Station on practical methods of grafting pines. Workable procedures for grafting seedlings on transplants, seedlings on seedlings, shoots of older trees on transplants, and needle bundle on older shoots were developed.

A large number of promising pine species, races, individuals, and hybrids were selected for extensive outplanting tests in California. The plan is to make mass plantings of these selected individuals in admixture with native unimproved species and allow field competition to indicate superior races able to hold their own on the ground.

Pollen germination technic was further improved so that tests can be made more quickly and with greater precision. Pine pollen must be exposed for 15 hours at 80°C. to render it unviable and effect sterilization of equipment.



SUPPLEMENTAL FUNDS

Direct Allotments

Projects	Allotments, 1941	Estimated allotments, 1942
Emergency Relief, Agriculture, Forest Service (Transfer from WPA): For projects in connection with forest management investigations:		
1. Silvicultural investigations .....	\$94,250	\$22,100
2. Mensuration investigations .....	4,000	800
3. Forest regeneration investigations ...	9,000	700
4. Fire protection investigations .....	15,000	100
5. Naval stores investigations .....	2,250	500
6. Forest genetics investigations .....	10,750	1,500
Total, above projects .....	135,250	25,700
Administrative funds included above .....	3,794	1,600
Total, Supplemental funds (direct allotments) .....	131,456	24,100

(h) RANGE INVESTIGATIONS

Appropriation Act 1942 plus \$2,168 supplemental for within-grade promotions .....	\$273,103
Budget estimate, 1943 .....	<u>255,500</u>
Changes from 1942:	
Reduction in working funds .....	-20,935
Additional for administrative promotions .....	<u>+ 3,332</u>
Net decrease .....	-17,603

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Grazing management in- vestigations .....	\$193,515	\$195,735	\$179,000	-\$16,735 (1)
2. Artificial revegetation ...	58,552	59,200	55,000	-4,200 (1)
3. Range forage .....	15,820	16,000	16,000	- -
4. Net cost of within-grade promotions .....	- -	2,168	5,500	+3,332
Unobligated balance .....	3,048	- -	- -	- -
Total appropriation .....	270,935	273,103	255,500	-17,603



### DECREASE

(1) The decrease of \$20,935, or \$16,735 in grazing management and \$4,200 in artificial revegetation will be met largely by reduction in force, both permanent employees and temporary service, together with reduction in facilitating services.

### WORK UNDER THIS APPROPRIATION

Objective: To make range lands more productive and to increase returns to farmers and stockmen from their use; specifically, to devise better methods of management, to increase forage production, and determine the most effective use of the thousands of native forage-producing plants growing on the range.

The problem and its significance: Sustained livestock grazing of the nation's 950 million acres of native forage producing lands is vital to the success of the range livestock business. The whole 13 billion dollar western agricultural enterprise is a complex of interdependent crop farming and grazing of range lands. Here range lands make up three-fourths of the total land area and furnish 65 percent of all the feed. From this territory come 75 percent of the nation's output of wool and mohair, 55 percent of the sheep and lambs, and one-third of the cattle and calves. In the Southeast, native forage on forest ranges rounds out the yearly forage requirements for livestock which furnish the needed diversification in agriculture and the milk and beef needed in rural human diet.

At this time when increased supplies of meat, wool, and hides are required in our national defense program, modification and improvement in the use of range lands for grazing purposes are necessary, resulting in increased requests for information and intensifying the need for research. The range as a whole is already fully stocked and much of it is still in a rundown condition--a result of unsound grazing use during the last war. To meet the increased livestock production goals will require better and more intensive range and livestock management, turning off more meat and wool per unit of range and from each animal grazed. This also brings to the fore the problem of better integration of range lands with other agriculture crop lands.

Practical and expedient methods of reseeding and planting the third of the western range that is dry and seriously depleted--some 240 million acres--would speed up restoration and furnish additional forage so badly needed now.

In the South, vast opportunities are available for improving range management, thereby increasing livestock production and rural welfare in that region.





General plan: Investigations under this appropriation are being carried on in Washington and at six regional forest and range experiment stations in the West and one in the Southeast. Cooperation is maintained in related phases with State Agricultural Experiment Stations, other federal agencies, and farmers and stockmen. The studies are conducted on typical range units and experimental ranges and organized under three work projects, namely, grazing management, artificial revegetation, and range forage investigations. A considerable amount of the appropriation for Range Investigations has already been shifted to problems connected with the agricultural defense program. Work on regular projects is at the minimum essential to maintain necessary records which it would be unwise to drop.

Examples of progress and current program: The following examples of specific accomplishments under this appropriation indicate progress made on the broad problems confronted and type of studies underway.

Project 1. Grazing management investigations:

Emphasis in recent years has been on determining the basis of conservative grazing for some of the more important range types, a system of grazing that provides for range improvement and at the same time allows farmers and stockmen to realize increased returns from their grazing operations. The development of the principle of conservative grazing has laid the foundation for sustained range use and profitable range livestock production in the United States.

In the short-grass type of the Northern Great Plains, for example, breeding cows run on conservatively grazed range yielded a 12 percent greater calf crop than cows on range slightly overgrazed. Calf production at weaning time on the conservatively grazed range averaged 50 pounds more from each breeding cow, was of better quality, and accomplished with one-third less feed cost. The conservatively grazed range was stocked about 25 percent below average annual forage production so as to avoid undue shortage of forage in drought years. Similar studies on winter range in western Utah with sheep have resulted in a greater net return of \$1,000 for a band of sheep on conservatively grazed range, in contrast to a comparable band on adjacent overgrazed range. At this area conservative grazing also amounted to stocking on the basis of 25 percent below forage production in an average year.

To meet the increased demands for livestock production from the range, intensified by the agricultural defense program, work is being directed toward determining additional specific criteria for better use of the many range types. Also the general principles developed thus far are being tested under different range conditions and translated into helpful, practical guides for use by farmers and stockmen in applying to their own range lands. More specifically, after three years' check of application in the Northern Great Plains of gauges for measuring range utilization, developed by this research project, the Agricultural Adjustment Administration will check compliance with its limited grazing benefit practice





throughout the West, by means of similar gauges, or forage volume tables, now available and to be developed. Such utilization will undoubtedly furnish increased livestock production without increased numbers of livestock or damage to the range.

## Project 2. Artificial revegetation investigations:

Work to date on this project has been chiefly centered on determining methods of revegetating depleted range lands with average or above soil and moisture conditions. Promising native species have been studied and grown in nurseries and on the range to determine the possibilities for their selection for large scale range reseeding operations. More than 100 introduced native plants have been tested out of some 500 species which may prove useful in the Intermountain Region. Stockmen in that region can now choose from about 25 or 30 plants that have been successfully seeded experimentally on the better range sites. For example, seeding smooth brome has increased the grazing capacity of the better oakbrush ranges in Central Utah as much as 9 times. Similar results have been obtained on foothill and other good mountain range sites through seedings of slender wheatgrass, crested wheatgrass, and mountain brome.

With the need for increasing forage for greater livestock production, efforts are now being directed toward determining suitable species and practical and economical methods of revegetating the vast acreage of the more arid and drier ranges that are in a rundown condition. Special effort is being directed to devise ways and means of restoring to range the 25 million acres of abandoned, plowed fields in the West that have proved submarginal for crop agriculture. Already hundreds of thousands of acres of such abandoned fields in the Northern Great Plains, and more limitedly in other western areas, have been seeded to crested wheatgrass as a result of this research. Also species are being determined and methods worked out for seeding and planting arid, airplane landing fields, as requested by the Army.

## Project 3. Range forage investigations:

This work includes the collection, identification, and the building up of a usable source of information concerning the most effective use of the important plants growing on the range in devising better range management practices. An annotated range plant herbarium consisting of some 90,000 plant specimens is now on hand as a source of readily usable information in answering requests from farmers, stockmen, and range administrators, regarding forage value, appropriate time and degree to graze, watershed protection and other similar questions regarding individual plant species.

Recent work on this project pertains, as the result of expanding grazing activity, to the examination of approximately 12,000 plant specimens from the United States, Alaska, and Puerto Rico, and assembling of information on important species of those not previously analyzed. Special work is devoted to the assembling of information on native plants for camouflage purposes in range areas. Other native range plants are being grouped and classified for use in landscaping of cantonments and stabilizing soils of Army supply centers.



SUPPLEMENTAL FUNDS

Direct Allotments

Projects	Allotments, 1941	Estimated allotments, 1942
<u>Emergency Relief, Agriculture,</u> Forest Service (Transfer from WPA): For projects in connection with range investigations:		
1. Grazing management investigations ..	\$25,500	\$5,250
2. Artificial revegetation investigations .....	6,050	1,200
3. Range forage investigations .....	17,050	- -
Total, above projects .....	48,600	6,450
Administrative funds included above ...	600	- -
Total, Supplemental Funds (Direct Allotments) .....	48,000	6,450



(1) FOREST PRODUCTS INVESTIGATIONS

Appropriation Act 1942 plus \$3,813	
supplemental for within-grade promotions .....	\$791,313
Second Supplemental National Defense	
Appropriation Act, 1942 .....	+175,000
Total available, 1942 .....	966,313
Budget estimate, 1943 .....	<u>1,016,260</u>
Changes from 1942:	
Increase in working funds .....	42,500
Additional for administrative	
promotions .....	<u>7,447</u>
Net increase .....	<u>49,947</u>

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase
1. Timber harvesting and conversion investigations .....	\$93,216	\$101,000	\$101,000	---
2. Forest products statistics ..	10,203	10,000	10,000	---
3. Pulp and paper investigations .....	113,373	126,000	126,000	---
4. Timber mechanics and engineering investigations ....	122,309	259,000	277,000	+\$18,000 (1
5. Seasoning and physical properties investigations ...	79,489	144,500	160,500	+16,000 (1
6. Chemical composition & wood utilization invest. ....	66,159	135,000	135,000	---
7. Wood preservation investigations .....	95,943	135,000	143,500	+ 8,500 (1
8. Wood structure and growth investigations .....	51,699	47,000	47,000	---
9. Net cost of within-grade promotions .....	---	8,813	16,260	+ 7,447
Unobligated balance .....	109	---	---	---
Total appropriation .....	632,500	966,313	1,016,260	+49,947





INCREASE

- (1) An increase of \$42,500 is requested for facilitating the use of wood and other forest products for use as war materials and for assistance in developing and sustaining a sound post-war economy, to be used as follows:

Objective: To provide the research and technical services needed in the selection, substitution, protection, proper use and conversion of forest products.

The problem and its significance: The emergency has created an unusual demand for optimum performance of wood and wood products, speed in their preparation for use, new and improved techniques in their fabrication and conversion, simple but effective methods of preservation and protection, the substitution of other kinds of wood for those most commonly used for specific purposes, and the modification of wood and its properties for special needs. In addition every effort is being made to substitute wood, where possible, for metals and other critical raw materials. Plywood, for example, is in wide demand for use in construction, in boat building, for aircraft construction, for boxes and dozens of other defense needs. Its properties must be known in order to design for these various uses. The number of species of wood used in its manufacture must be widened, its method of manufacture for special uses must be controlled and it must be properly protected against too rapid deterioration in use. Laminated and spliced wood or, in brief, the making up of large structural members from pieces of small dimension, now coming more and more into use, from roof truss construction to airplane wing beam construction, must be thoroughly understood from the preparation of the wood on through the gluing and assembling processes to its structural performance. Every day brings requests regarding the applicability of wood plastic and plastic wood to uses for which scarce materials have been used. Their applicability to sundry defense uses must be explored and their properties and fabrication adjusted to new demands. Lumber and timbers can be seasoned naturally and artificially but the exacting requirements for certain classes of war materials and the necessity for speed in drying bring new problems to the Laboratory to solve.

Plan and location of work: Practically all of the research and technical work required would be done at the Forest Products Laboratory. It would be conducted in close collaboration with the Army, Navy, individual concerns with defense orders, Civil Aeronautics Administration, The National Advisory Committee for Aeronautics, the Office of Production Management, and other National Defense agencies concerned. It is planned to carry out the program about as outlined in the following table, but as needs are developed by further conferences with appropriate authorities it is expected that additions to and modifications of the general plan will have to be made from time to time. In brief, the program will depend to a large extent upon the needs as they continue to arise or as there are indications that work needs to be done.



Financial requirements: Already great changes have been made in the direction of forest products research to meet requests for work on problems of wood use connected with defense. Non-defense research has been cut to such a minimum that only those projects are being continued which it would be extremely uneconomical to discontinue at this time. However, assistance being rendered, and which will have to be rendered in the future as needs become more acute, can not be fully met with existing facilities. With the character and urgency of requests upon the Forest Products Laboratory changing almost from day to day, it is necessary to maintain some degree of flexibility as to items or problems that will receive initial or increased attention, but, based on present demands, the increase of \$42,500 requested would be applied as follows:

By projects:

Project 4. Timber mechanics and engineering investigations .....	\$18,000
Project 5. Seasoning and physical properties .....	16,000
Project 7. Wood preservation investigations .....	<u>8,500</u>
Total, by Work Projects .....	42,500

By items:

Plywood .....	\$19,000
Laminated wood and spliced wood .....	7,500
Plastic wood and wood plastic .....	6,000
Accelerated drying .....	<u>10,000</u>
Total, by Items .....	42,500

Forest Products

WORK UNDER THIS APPROPRIATION

Objective: To increase the usefulness and value of forest products; specifically, at present, to provide research and technical services needed in the selection, substitution, specification, and efficient use of forest products required for defense needs and for assistance in developing and sustaining a sound post-war economy.

The problem and its significance: In the face of mounting shortages of metals and many other raw materials, wood is being used more and more to help meet our national defense and civilian needs. Problems of proper use of wood arise not only in connection with the use of wood as a substitute material, but also in connection with uses for which wood has long been used, and for which better techniques need to be developed. For example, wood has long been used for boxing and crating, but improved containers are needed to protect from breakage sensitive communication equipment, airplane parts and instruments, and to save cargo space in the shipping of various military, food and other supplies transported in the present emergency.



Lumber and timbers have long been seasoned naturally and artificially, but the exacting moisture content requirements for certain classes of war materials and the necessity for accelerating the rate of seasoning gives rise to new drying problems. The increased use of wood in ship construction requires better methods of wood selection and the development of suitable techniques for seasoning, and bending of special items such as boat ribs.

Wood bark and wood fiber appear promising as substitutes for such materials as cork. The demand for increased quantities of alpha cellulose for nitration into explosives creates new problems of what species can be used and how it can be done. Prospective shortage of pulp make it important to secure greater yields from domestic woods and from an increased number of species.

Government agencies and aircraft manufacturers are turning to wood as a substitute for aluminum alloys in the construction of parts of combat planes, and for its wider use in the construction of training planes. Therefore, it is necessary to determine the design properties of natural and modified forms of solid and laminated wood and plywood as applied to aircraft construction.

General plan: Practically all of the research and technical work under this appropriation is being conducted at the Forest Products Laboratory at Madison, Wisconsin. It is estimated that 70 to 80 percent of the appropriation for Forest Products Research is devoted to work connected with the defense program. "Non-defense" projects have been eliminated or reduced to the minimum required to preserve major results of past research in those cases where complete abandonment of the work at this time would be extremely uneconomical. Insofar as the defense work is concerned, it would be conducted in close collaboration with the Army, Navy, private companies with defense orders, Civil Aeronautics Administration, National Advisory Committee for Aeronautics, Office of Production Management, and other National defense agencies concerned.

Examples of progress and current programs:

Project 1. Timber harvesting and conversion investigations:

Investigations of the production costs and the yield of lumber of various grades from logs of different species and sizes sawed in typical mills have contributed materially to the practice of forestry and the utilization of forest products. Studies of the machining and utility characteristics of little-used species have established optimum conditions of fabrication for the more troublesome species. Utilization of low-grade and waste wood has been greatly increased through more efficient harvesting and processing methods, with the result that timber lands return greater profits.







As a farm forestry measure and protection against shortages of domestic coal during and after the national emergency, a machine is under development for the more efficient preparation of fuel wood for automatic feed stoves and furnaces. A system of grading logs to meet defense requirements, particularly with regard to aircraft veneer, is being worked out. To improve small sawmill practices, now notoriously inefficient, training courses for Departmental field agencies are being pursued. A survey of use requirements in fabricating industries is under way with a view toward aiding where possible in the replacement of priority materials with wood.

Project 2. Forest products statistics:

The collection of factual information on the production, consumption, and distribution of lumber and other forest products has been a continuing cooperative project with the Bureau of the Census since 1902. The Forest Service has conducted the yearly canvass of lumber and timber products in 12 western states since then and in recent years in the Southeastern and Lake States as well.

The present emergency has brought an increasing demand for information of this character which is essential to the orderly manufacture and marketing of forest products; the maintenance and proper distribution of adequate and suitable supplies for wood users; and as a basis for planned forest production. The demands by National Defense agencies and others for information on production and supplies of forest products and manufacturing plant capacities are becoming more and more insistent.

Project 3. Pulp and paper investigations:

Investigations of the pulping characteristics of various species have made major contributions to the regional developments of the pulp and paper industry during the past 25 years, as exemplified by the Kraft mills in the South now producing bleached and unbleached pulps, the recent manufacture of newsprint paper in the South, and the sulfite mills on the Pacific Coast. Possibilities of extending the use of readily available hardwoods have been developed by substituting semichemical pulps for chemical pulps now used in mixtures with ground wood for such products as newsprint paper and boards. Bleaching and further purification of semichemical pulps have given high yields of bleached pulps as well as high yields of essentially pure alpha cellulose (used in explosives) superior to usual methods.

To meet emergency demands for improved yield and quality of pulp and for additional sources of alpha cellulose, the work now under way is concentrated on species having high pulp yields, largely hardwoods; to study the effects of wood selection and cutting practices on yield and quality of pulp from white spruce, black spruce and balsam fir; to improve pulping processes to increase yield; to study new processes; and to study the development of special characteristics in domestic pulps heretofore available only in imported pulps.



Project 4. Timber mechanics and engineering investigations:

Investigations of the basic principles of the design and construction of shipping containers over the past 25 years have resulted in better containers from lower grades, the use of new species, and enormous reductions in loss and damage. Rules have been developed from mechanical tests of wood for grading timbers for strength rather than appearance. Formulae have also been derived that solve many problems involved in the use of wood, particularly in modern aircraft. Investigations of laminated arches and modern timber connectors have opened new engineering and architectural outlets for wood.

Emergency demands are calling for the broadened application of many of the research findings on wood properties and uses, and accelerated investigations of new problems. Important emergency research includes various studies on plywood in relation to aircraft design, particularly the plywood buckling and the plywood strength problems; the evaluation of compressed wood as an aircraft material; the preparation of a building code on wood requirements for emergency housing; the development of laminated construction for airplanes and ships; the preparation of specifications for aircraft woods and for other defense applications; and the development of shipping containers for ordnance equipment and lend-lease commodities.

Project 5. Seasoning and physical properties investigations:

Investigations of the seasoning of many species of wood have made major contributions to the arts of kiln drying and air seasoning, and have brought about the conception and development of chemical seasoning of lumber and other timber products. Studies of the movement of water vapor through house walls and ceilings have led to the development and improvement of methods of construction which minimize the trouble experienced through the condensation of water in these house elements. Research growing out of chemical seasoning experiments has resulted in the invention of a type of plastic wood in which urea, alone and in combination with other chemicals, is the plasticizing agent.

To meet national defense emergency demands for lumber and timbers, the seasoning work now under way is concentrated on chemical seasoning; on accelerated drying through the use of fast air circulation in the dry kilns; and on fast drying and hot gluing of wood by means of high-frequency electrostatic fever machines. Further development of plastic wood is being pushed, particularly with reference to the possible substitution of this material for steel, copper, aluminium, and other scarce metals.

Project 6. Chemical composition and wood utilization investigations:

The acid and aniline hydrolysis processes for making wood plastics have been developed and promise important reductions in the amounts of phenolic resins needed for molding compounds. The chemical composition





of lignin and its isolation from wood have been studied. Examination of the chemical composition of wood has developed higher yields of alpha cellulose from holocellulose. The application of hydrolysis and mechanical pressure during distillation resulted in an improved gas mask charcoal. Resin-impregnated and compressed woods have been developed that indicate a variety of uses in aircraft and ship-building, with high-strength properties and resistance to moisture and swelling. Many promising compounds for preservation of wood have been found through toxicity studies.

Work now under way on the hydrogenation of lignin promises production of several new chemicals including anti-knock compounds for airplane and other motors. Better gas mask charcoal and wood pulp filters for gas masks are being sought. Higher production of alpha cellulose from semichemical pulps is being developed with a view toward increased yields of high grade pulp from domestic species. Improved molding methods for wood plastics are being studied, and bag and press molding of both impregnated and compressed woods are being examined. Toxicity studies are being continued in the search for substitutes for creosote, now in great demand for national defense purposes.

#### Project 7. Wood preservation investigations:

Investigations have developed techniques for the successful preservative treatment of all the native commercial species of wood so that their serviceability when used in contact with soil or water may be greatly increased. Wood gluing studies have established the essentials of good gluing practice with various glues, species of wood, and types of joints. The paint-holding properties of different woods have been determined, the effectiveness of aluminum paint discovered, the necessity of avoiding marked changes in paint composition in succeeding paint jobs has been shown, and a system of paint classification and grading devised. Numerous materials have been tested to determine their effect in retarding combustion in wood. A fire-retardant paint has been developed.

There is need to increase the availability of good preservatives for wood, if possible, from sources that are not affected by shortages and priorities, for instance, from some of the by-products of the petroleum refining industry. The effect of drying temperatures on the strength of veneer is being examined. To meet national defense needs, the possibility of improvement in the manufacture of flat and molded plywood and the suitability of the new synthetic-resin glues in the assembly of airplane parts are being studied. Improved finishes and moisture repellents for aircraft and fire-retardant treatments for national defense structures are also being studied.

#### Project 8. Wood structure and growth investigations:

Accurate identification of wood species and more rapid detection of defects are among the fruits of studies of wood's microscopic structure. A simple box-light device has been designed for quick scrutiny of aircraft woods suspected of containing compression wood, the presence of





which weakens spars and other airplane parts. Identification keys for general use have been devised for a broad range of domestic species. Studies of the relation of wood to its properties have helped greatly in diagnosing the causes of unexpected breakage and warping of wood members. Marked changes in growth rates of coniferous species and presence of compression wood have been shown to be the cause of much lumber warping.

Substitutes for cork from the barks of domestic and available foreign species are being sought. Simpler and more accurate methods of detecting obscure defects, such as compression failures, spiral grain, and hidden pitch pockets, are under consideration. The effect of incipient compression wood on the properties of airplane woods, and other relations between growth characteristics, wood properties, and structure require further study to insure reduction of waste and improved utilization. Likewise, the effect upon lumber of trees subjected to severe changes in growth rates needs further examination, particularly among stands where young growth is suddenly accelerated by thinning. The relation of growth conditions to black walnut suitable for gunstocks is being investigated.

# SUPPLEMENTAL FUNDS

## Direct Allotments

Projects	Allotments, 1941	Estimated allotments, 1942
<u>Emergency Relief, Agriculture,</u>		
<u>Forest Service (Transfer from WPA):</u>		
For projects in connection with forest products investigations:		
1. Timber harvesting and conversion investigations .....	\$2,000	---
2. Forest products statistics .....	---	---
3. Pulp and paper investigations .....	2,650	---
4. Timber mechanics and engineering investigations .....	2,900	---
5. Seasoning and physical properties investigations .....	2,100	---
6. Chemical composition and wood utilization investigations .....	1,350	---
7. Wood preservation investigations ..	2,650	---
8. Wood structure and growth investigations .....	1,600	---
Total, Supplemental Funds (Direct Allotments) .....	15,250	---



(j) FOREST SURVEY

Appropriation Act, 1942 plus \$3,292  
supplemental for within-grade  
promotions ..... \$252,629  
Budget estimate, 1943 ..... 250,000

Change from 1942:  
Reduced amount for administrative  
promotions ..... 2,629  
Decrease ..... 2,629

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Forest Survey--Present and future requirements .....	\$246,730	\$247,000	\$247,000	
2. Net cost of within-grade promotions .....	---	3,292	663	- \$2,629
Transfer as shown in Budget schedules.....	3,000	2,337	2,337	
Unobligated .....	270	---	---	---
Total appropriation .....	\$250,000	\$252,629	\$250,000	- 2,629

Forest Survey

WORK UNDER THIS APPROPRIATION

Objective: To furnish, for both peace and war-time needs, information on the extent and condition of all forest land and our requirements for forest products. This requires field study to determine for both public and private forest land the extent, quantity, quality, and kinds of timber, and condition of cut-over land, rate of timber depletion from all causes; current and potential growth; and present and potential future requirements for forest products. Analysis and interpretation of these findings is basic to a proper understanding of the forest situation and to the formulation of principles, policies and plans for permanent forest land management and all that goes with it in the way of stable communities and regular jobs for workers.



The problem and its significance: The problem is to make an inventory by field examination and sampling of all forest land in the United States - estimated at 630 million acres, and to determine present and future trends of our requirements for forest products. No complete inventory has ever been made. Evidence of forest depletion is widespread and 77 million acres of forest land, once timbered, is now nonstocked or poorly stocked.

It is significant that raw material requirements for national defense and civilian needs is currently focusing increasing attention on the supply of forest products because of serious shortages of other materials used in place of wood and on account of mounting demand for lumber in its normal markets. Logically this raises the question of how much, where and what kinds of timber are available, and to what extent the forest resource is being damaged by overcutting. We must have a basis which this project provides, for plans that will assure a permanent, adequate supply of forest products as one means of safeguarding national welfare.

Both now and in post-defense times reliable information on forest land is essential to nation-wide land-use planning and to keep pace with new developments resulting from forest products research which depend for full realization upon knowledge of the supply and location of the various species under consideration.

General plan: This project requires field study of all forest land in the United States - estimated at 630,000,000 acres, and searching analysis to determine present and future trends of our requirements for forest products. Field work to cruise the timber and study the situation, and office compilation and analysis of information from many sources are both required. Trained foresters, engineers, and economists carry on the study at six of the regional forest experiment stations and in the Washington office.

Both in the field and in Washington regular work is being adjusted to meet defense requests for forest resource and requirements information such as the amount and kinds of timber in the vicinity of proposed defense plants, or facts to set up production goals for timber along with other soil crops. In addition the usual numerous requests for Forest Survey information from State and Federal bureaus, planning boards, railroads, industrial, and farm timberland owners are met.

Current program and progress: During the year all of Virginia and about two million acres in Montana were inventoried. In addition depletion figures for use in keeping the inventory on the volume of standing timber up to date for the area covered were obtained by field men cooperating with the Bureau of the Census in securing the lumber production of sawmills in 14 eastern states, and by mapping cut-over and burned-over areas for 6 counties in western Oregon and Washington.

To supplement the requirements phase the third canvass of wood-using industries to determine periodically - say every 5 years - the amount





and kinds of lumber used by various manufacturers was initialed for the entire United States and is being carried on in cooperation with the Experiment Stations, Forest Products Laboratory, Division of Private Forestry, and the Bureau of the Census.

Fifteen reports covering about 100 million acres already examined and type maps for North Carolina, South Carolina, and one-fourth of Minnesota were prepared and released. Several of the reports deserve special notice. One of these covers the Douglas fir region - that great reservoir of virgin timber with an accompanying anachorism of 4 million acres of cut-over burned-over forest land. Another is for the southern one-third of Georgia, which is probably the most intensively used for forest production of any area of comparable size in the United States. Still another bears on our timber requirements for naval stores.

To date 300 million acres have been inventoried which leaves 330 million acres to cover. About three-fourths of the area studied has been reported on by 187 reports and forest type maps for all or part of 13 States, principally in the South, Appalachian, Lake States, Inland Empire, Pacific Coast, and California regions.

Plans for this year are to complete reports for areas studied, keep up to date work already done, and cover as much new country as funds permit, estimated at 10 to 15 million acres. At this rate of progress, three to four decades will be needed to inventory the remaining half of the country, whereas it should be done in 6 to 8 years for best results. The Joint Congressional Committee on March 24, 1941 recommended that Sec. 9 of the McSweeney-McNary forest research Act of 1928 be amended "to authorize an annual authorization of \$750,000 for early completion of the Forest Survey of the United States." This is three times the present appropriation of \$250,000 which is the maximum authorized by the Act.

## SUPPLEMENTAL FUNDS

### Direct Allotments

Projects	Allotments, 1941	Estimated allotments, 1942
Emergency Relief, Agriculture, Forest Service (Transfer from WPA): For projects in connection with forest survey investigations:		
Forest survey: present and future requirements .....	\$345	---
Total, Supplemental funds (direct allotments) .....	345	---



(k) FOREST ECONOMICS INVESTIGATIONS

Appropriation Act 1942 plus \$1,490 supplemental for within-grade promotions .....	\$141,490
Budget estimate, 1943 .....	<u>133,000</u>
Changes from 1942:	
Reduction in working funds .....	-10,000
Additional for administrative promotions .....	+1,510
Net decrease .....	<u>-8,490</u>

PROJECT STATEMENT

	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. New public domain investigations .....	\$25,258	\$24,350	\$21,000	-\$3,350 (1)
2. Financial aspects of forestry .....	70,038	69,650	63,000	- 6,650 (1)
3. Stumpage, log, and lumber prices .....	13,928	14,000	14,000	---
4. Range economics .....	14,326	15,000	15,000	---
5. Economic-social benefits of forestry .....	16,378	17,000	17,000	---
6. Net cost of within-grade promotions .....	---	1,490	3,000	+1,510
Unobligated balance .....	72	---	---	---
Total appropriation ...	140,000	141,490	133,000	-8,490

DECREASE

(1) The decrease of \$10,000, or \$3,350 in new public domain investigations and \$6,650 in financial aspects of forestry investigations will be met largely by reduction of force, both permanent employees and temporary service, together with reduction in facilitating services.

FOREST ECONOMICS

WORK UNDER THIS APPROPRIATION

Objective: To furnish information needed in solving the problems associated with the transition from unregulated forest exploitation to permanently productive forests, in planning for stable forest industries, in formulating sound programs of public acquisition of forest land, in the determination of economically and socially practicable



forest land-use principles, and in meeting demands for information and other special services arising out of defense activities. The basic purpose of these investigations is to make forests contribute permanently and in increasingly greater degree to the national welfare.

The problem and its significance: The logical scope of studies in forest economics is virtually co-extensive with the entire field of forestry. Almost every forestry problem has important economic aspects, and its solution is dependent in part on economic considerations. Information and analysis are needed that can be furnished only by trained forest economists.

Because of this multitude of pressing problems, work priorities must be scrutinized with great care, particularly in view of the limitation of funds. This has become even more imperative during the past year, because of the expanding opportunities for participation in the defense effort, which have necessitated considerable deferment of established projects.

The report of the Congressional Joint Committee on Forestry names commercial forest lands in private ownership as the Nation's major forest problem. As such, it bristles with urgent economic questions. What constitutes a sound economic foundation for sustained-yield management of such lands? Where and under what conditions and to what extent can improved forestry practices be made financially feasible? How utilize and interpret data on costs and returns as a guide to more effective land use and forest management practices? Under what circumstances is public ownership more suitable and economical than private ownership of forest lands?

Other problems of highest priority that require economic analysis, frequently in correlation with other forest research, are the problems resulting from wholesale abandonment of cut-over lands, formulation of practical methods of placing the limited reserves of virgin timber on a sustained-yield basis, collection of current data on prices of forest products, the economic aspects of cooperative associations for the management of farm woodlands and the market of products therefrom, the social and economic effects of alternative patterns of range privilege distribution on national forest lands, the rehabilitation of resources and people in submerged forest communities, and--of paramount immediate importance--furnishing data and plans and otherwise participating in many aspects of the defense effort.

General plan: Forest economics investigations are in process at eight forest experiment stations, and by a small group of technicians in the Washington office. Cooperative working relationships are maintained with a number of State experiment stations, trade associations, private industrial concerns, local cooperative associations, the Bureau of the Census and other Federal bureaus, including defense agencies.





Examples of progress and current programs:

1. New public domain investigations:

The work program under this project has been refocused during the past two years; emphasis has shifted from gathering of data to planning for remedial measures. Means of preventing bad land use (a fundamental cause of tax delinquency) and proper disposal and management of tax-reverted lands are important phases upon which work is now being concentrated.

This revised type of effort properly involves increased cooperation with State, local, and other Federal agencies working on land-use problems. For example, Forest Service studies and personnel have contributed significantly to the program contained in the 1940 Report of the Minnesota Interim Legislative Committee on Forestry; to the work of the Governor's Economic Council in drafting rural zoning legislation for Oregon, and in working out desirable modifications in existing legislation for acquisition of tax-delinquent lands in that State; to work along similar lines in Oklahoma, Mississippi, Florida, and Arkansas, at the request of officials of these States; and to the recommendations for land utilization in California made in cooperation with the Giannini Foundation and the University of California.

As an example of the status of work under this project at a particular experiment station, data on the extent, location, and character of tax-delinquent forest land in the Lake States (some 20 million acres) have been compiled. A comprehensive report is scheduled for publication in the fiscal year 1942 on the status of delinquent land, public ownership, and forest conservation policies. This report will be used to facilitate and supplement the service to public agencies which has already been mentioned, and thus to guide further State legislation. A special problem which is pressing for further attention concerns the northern hardwood region of Michigan and Wisconsin. About 150 million dollars is invested in forests and mills, and about 65,000 men receive full or part-time employment. The forests are being rapidly devastated--tax delinquency and land abandonment are the rule. Studies will be made of possible remedies for this situation and effects of such remedies.

2. Financial aspects of forestry investigations:

This project has two phases. The first is the study of the financial aspects of commercially owned forests to determine the extent to which improved forestry practices are economically feasible, and may contribute to community and industrial stabilization and welfare. An outstanding example of valuable results from such efforts is the improved management of private forest lands throughout the South--a movement that is gathering momentum progressively. Major investigations in that region have centered around the experimental forest at Crossett, Arkansas. A continuing series of publications on the economic aspects of sustained-yield forestry is aiding the translation of research findings into practice by private owners. These findings have also been incorporated into the management policies of national forests in the region. Field demonstrations of good practices on the Crossett Forest have aided in converting



many owners and operators to forestry, since the area is visited annually by several hundred farmers, lumbermen, pulpwood operators, foresters, and timberland owners from many States and even foreign countries.

The second phase covers the economic problems of farm woodlands. Emphasis is placed on means of making farm woods contribute more to farmers' incomes and to stabilization of local woods industries. In the South the work consists largely of adapting the research findings on commercial forests to the special conditions of southern farm woodlands. In this there has been substantial cooperation with the Bureau of Agricultural Economics and Soil Conservation Service. The results are proving of much value to county agents, local planning agencies, and extension foresters, as well as to individual farmers. Work in the Central States is directed toward analysis of the present and future place of farm woodlands in the agricultural economy of the corn belt. Some findings are already available, and others are in prospect shortly. These results should be useful to all persons concerned with woodland management, because they will explain the practices needed to increase the farm income and the rural social benefits dependent on farm woodlands. In the Northeast, efforts center around collaboration with the cooperative association in Otsego County, New York. This organization now has over 700 members, control of cutting has been established on all members' woodlands, the cash income of private farmers has been raised significantly by improved utilization of their woods, and the community has benefited by increased employment. Studies of this association, which is regarded as a pilot plant, should yield results that will bear on almost all phases of organization and management of farm forest cooperatives throughout the country.

By-products of work under this appropriation have been important. Recent examples include studies of European forestry; how small sawmills may adapt their operations to withstand the effects of the fair labor standards act; forest credits, in connection with the preparation of the Departmental report thereon; and phases of South American trade in forest products that bear on the defense program.

### 3. Stumpage, log, and lumber price investigations:

Basic stumpage and log price data are collected annually through a cooperative agreement with the Bureau of the Census; basic lumber price data are obtained currently from trade associations. Public distribution of current publications, arising largely from specific requests, was in excess of 4,000 items last year. The project is logically a continuing one.

Accomplishments during the past year included the preparation and issuance of a Departmental statistical bulletin on stumpage and log prices for 1939; the compilation and analysis of similar data for 1940, and the issuance of eight regional preliminary releases based thereon; and the preparation and distribution for Forest Service administrative use of quarterly and annual releases on prices of southern pine lumber and of southern and Appalachian hardwood lumber.





Because of the emergency, one phase of this project, previously of subsidiary character, has greatly expanded during the past year. This involves specialized and detailed compilations of data on imports and exports of forest products, and analyses of these data in the light of domestic production. Such special information has been in demand, both within the Forest Service and by other Departmental agencies, for transmittal to and consideration by OPM and OPA in formulating defense policies and procedures. A specific example of the use of such special data is in the field of paper and allied products; greatly increased domestic consumption, coupled with serious curtailment of imports and large increases in exports, has resulted in a critical situation that necessitates careful defense planning for the immediate future.

#### 4. Range economics investigations:

Work under this heading supplements on the economics side the program of range management research authorized under the McSweeney-McNary Act of 1928. Thus far studies are not extended beyond the intermountain region. Although the project is still young, the past two years have brought consistent advancement of basic studies, and two lines of investigation are leading to valuable results.

One line has been the assembling of basic information for the intermountain region as a whole. No inventory of the public land grazing resources, their use, and distribution of use, has ever been made before in this region. The assembled data are being presented graphically in a series of releases; two have already been made, and the third and final release will be made shortly. This inventory is of fundamental importance because it supplies the basic information needed by Federal and State agencies, including regional and local planning committees, in order to build action programs leading to greater economic stability for more family-sized ranches and farms, and better adjustments in the use of public range resources.

The second line of work involves local economic investigations. As an example, one is directed toward the central Utah area around the Manti and Fishlake National Forests. The work has developed a complete picture of all the public land grazing privileges in the area on an operating unit basis; a census of farms showing their organization, livestock numbers, and gross income from crops and livestock; an inventory by seasons of the present amount of public land grazed; general information, such as data on population, climate, and income other than agriculture; information showing the relative efficiency of the different sizes and types of livestock enterprises; and maps of the movements of livestock in the area from the different seasonal ranges and ownerships of range. Work is now under way to determine the feed resource of the area both from ranges and harvested feed crops, and to afford a more complete knowledge of the efficiency of the different types and sizes of livestock enterprises of the area. It is expected that the analysis of all data for this phase of the project and the preparation of a preliminary report will be finished in the fiscal year 1942. Evidence indicates that some alterations in organization of





farm enterprises and in grazing permit policies on the publicly owned lands will be necessary to insure adequate and permanent farm and ranch income. The form these alterations should take is becoming increasingly clear as the study progresses.

5. Economic-social benefits of forestry investigations:

This project was initiated at the Allegheny Forest Experiment Station in the fiscal year 1940. It is intended to furnish the information needed in preparing plans and an action program for the rehabilitation of the forest resources in the Pennsylvania anthracite region (about 2 million acres of forest land), and thereby provide an adequate supply of mine timber at reasonable cost; to aid in terminating the evil effects of bootleg mining; and to develop a series of work projects as a safeguard against post-defense unemployment of miners.

A plan for improved fire control measures throughout the region has been completed and local committees of the Anthracite Institute and Wyoming Valley Chamber of Commerce are attempting to convert this into an action program. A comprehensive inventory of the forest resource necessary to the formulation of other useful rehabilitation projects has been completed for Luzerne and Lackawanna Counties and is now underway in Carbon County. A report will be issued shortly covering Luzerne County, including data on stand volume by tree species and size, current drain, timber requirements, and employment in wood-using industries. This will expedite the preparation of appropriate local action programs.

Additional investigations now in process include work on forest ownership, taxation and tax delinquency of forest lands, tree volume tables, measurement of green wood weights, recreational uses of forest lands, and the relation of forest cover to the problems of mine water. Three progress reports have been issued on these phases of the work, and others are in preparation.



SUPPLEMENTAL FUNDS

Direct Allotments

Projects	Allotments, 1941	Estimated allotments, 1942
<u>Emergency Relief. Agriculture,</u> <u>Forest Service (Transfer from WPA):</u> For projects in connection with forest economics investigations:		
1. New public domain investigations ...	---	---
2. Financial aspects of forestry investigations .....	\$3,250	\$700
3. Stumpage, log, and lumber price investigations .....	---	---
4. Range economics investigations .....	1,800	350
5. Economic-social benefits of forestry investigations .....	---	---
Total, Supplemental Funds (Direct Allotments) .....	5,050	1,050



(1) FOREST INFLUENCES INVESTIGATIONS

Appropriation Act 1942 plus \$1,820 supplemental for within-grade promotions ... \$136,820  
 Budget estimate, 1943 ..... 129,000

Changes from 1942:  
 Reduction in working funds ..... -10,000  
 Additional for administrative promotions ..... +2,180  
 Net decrease ..... -7,820

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Influence of forests on streamflow investigations ...	\$ 63,895	\$65,000	\$55,000	\$-10,000(1)
2. Investigations of utilization of water by trees .....	37,991	32,000	32,000	---
3. Investigations of stabilizing soils .....	19,765	27,500	27,500	---
4. Investigations of the effect of forest cover on climate ..	12,864	10,500	10,500	---
5. Net cost of within-grade promotions .....	---	1,820	4,000	+2,180
Unobligated balance .....	485	---	---	---
Total appropriation .....	135,000	136,820	129,000	-7,820

DECREASE

(1) The decrease of \$10,000 in the investigations of the influences of forest cover on streamflow will be met largely by reduction of force, both permanent employees and temporary service, together with a reduction in facilitating services.





## Forest Influences Investigations

### WORK UNDER THIS APPROPRIATION

Objective: To increase the effectiveness of natural plant cover in its relation to water, soil, and climate. Specifically, to measure the influence of natural vegetation on water supplies, stream behavior, floods, soil productivity, and climate; to determine the extent that beneficial influences can be augmented or modified in man's behalf; and to develop practical methods of using, maintaining or restoring vegetation while at the same time obtaining benefits through its use.

Problem and its significance: Practically every watershed of the nation contains some of the 630,000,000 acres of forest and 585,000,000 acres of non-forest range land. Floods, irregular streamflow, water shortages, muddy streams and choked rivers and harbors bear testimony that few of the lands in these watersheds are not suffering from abuse. There is increasing evidence that deteriorated forest and other wild lands are important sources of damaging flood water and debris. For instance in the southern California section a single fire can destroy a vegetative cover ample for watershed protection purposes and produce a condition wherein flood run-off and debris can result in great damage. A few years of overgrazing of range lands can so diminish vegetation that a few inches of rainfall can cause mudflows with attendant loss of life and property. Flash floods, extremely low summer and autumn streamflow, and diminished underground water supplies are associated with depleted condition of vegetation of many watersheds. Reservoirs for municipal water supply, irrigation, flood control, and power throughout the United States have lost an alarming amount of their effective capacity due to siltation largely resulting from removal or depletion of vegetation of the watersheds. Civilization and settlement dependent upon these costly developments are threatened by an accelerated process largely man caused. The destructive forces set in motion by the deterioration of the land and its vegetation can be reversed and prevented by rehabilitation and maintenance of a vegetable cover, and the life of mankind thereby extended.

In the past, policies as to the use, management and ownership of forest and range lands have been based on a too narrow scope of facts regarding potentialities and limitations of the lands. Some of the most important facts of land use and management are those related to the water cycle. Capacity to use beneficially or deliver water to some other locality needing it are important criteria in evaluating land and formulating programs for its best use.

As the public acquires ever growing acreages of land, it assumes responsibility for management in the public interest. As many



of the lands are in deplorable condition when acquired, restorative practices are essential to reduce floods, to prevent erosion, and to build up the water and soil resource. Under the various relief programs of the past decade much has been done to aid in the conservation of the basic resources, but because of the tremendous task, great acreages, and difficult problems, much of the work has not yielded maximum supplies of usable water. As time is required to obtain basic facts on best types of programs and on techniques to be used, there should be no delay in developing these water resource development programs and techniques for the post defense period. It is believed that many of the works of which millions of dollars of public funds have been spent for flood control, irrigation, water supply, power, navigation, etc., can have their useful life greatly extended and the need for costly maintenance reduced if lands, especially the public lands, receive proper management.

General plan: Investigations in this field are conducted as part of the activities of seven regional forest experiment stations. The investigations have been planned in accordance with a national plan which has twice been presented to the Congress. In carefully developing this plan, only a few of the most important national and regional problems have been attacked so far, leaving to the future the initiation of the work on other major and equally important problems. Currently as the work progresses, changes in emphasis are made to meet changing conditions and to seek solutions to the more urgent and pressing questions. At present, defense implications and post defense activities are a dominant feature. Effort is made to prevent duplication and overlapping and through cooperation with other public and private agencies to accomplish the maximum of results with a minimum of expenditure.

Examples of progress and current programs:

Project 1. Influence of forests on streamflow:

The broad objective is to determine how forests and other wild land vegetation affect water behavior and water supplies. The results are used in establishing management procedures, especially those on National Forests watershed lands and in evaluating Departmental programs involving public acquisition, land use readjustment, and land management. The results of this research are particularly useful in connection with the Department's flood control program, and promise even greater utility in post defense activities.

As a result of this work, in southern California, a "flood warning service" to local communities has been developed to prevent flood damage following fire. Further, the relation between cover and ground water supplies has been recognized. Strong local demand for more intensive protection of local watersheds has resulted.





In Utah, this research has traced damaging summer flash floods and mudflows to their chief source in deteriorated portions of watersheds. Suggested control measures have been applied by the CCC on some of these abused lands purchased by local interests for inclusion in National Forests.

Infiltration research developed techniques to determine rates at which water is absorbed into soils, which are being generally used in evaluating the hydrologic effects of the Department's program for flood control.

Effects of different types of vegetation and their management necessitate detailed studies. These require continuity in observation over a considerable period because of the variability of streamflow and its behavior which are so closely related to the variations in intensity and amount of precipitation from season to season. Observations on several watersheds in different sections have now reached a stage permitting manipulation of cover conditions.

## Project 2. Stabilization of Soils:

On areas already covered with timber or grass, the objective is to find ways of utilizing timber and forage crops to the fullest extent without impairing the stability of the soil. A second objective is the development of methods for stopping soil loss on areas already damaged; in most cases this will be attempted by revegetation but occasionally supplemented by minor engineering measures.

A new set of standards for roadbank treatment on the National Forests of Mississippi has been based on results of research under this project at the Southern Station.

In California this research has shown the sowing of mustard on freshly burned-over chaparral reduces the amount of debris carried by the floods which almost inevitably occur following fires. This is now a standard procedure on critical areas in the national forests of southern California.

In the southern Appalachians, backslopes of 2,000 miles of established roads (Federal, State and local) have been protected by application of a mulch of forest litter, a practice developed by the Appalachian Station. This method of reducing roadbank erosion has been adopted by several state and local highway boards and is being applied to new road construction, also.

Future tests will include sowing and planting of introduced species and the use of fertilizer to hasten and insure success of revegetation on raw exposed sub-soils, studies of the rate at which unassisted natural revegetation can stabilize soils, and of the use of perennial plants; and methods of holding soils in slides, of preventing avalanches, and of holding unstable masses in the steep mountain areas of the west.

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### Project 3. Utilization of water by trees:

The purpose of this research is to determine how much water is used by forest and other wild land vegetation. The consumptive use of water by trees, first in the form of interception of precipitation, and later through transpiration, is an important factor in the hydrologic cycle. Quantitative measurements of the water so used are necessary in the analysis of the effects of forests upon streamflow and water supply.

Some of the recent findings are as follows:

The Rocky Mountain Station has found that dense forest cover may intercept nearly 20 percent of the winter snowfall thereby reducing the water yield during the following summer. Where the yield of water is important, such a loss may be very serious. These studies are indicating that the snow catch may be increased by the formation of openings in the timber. Further study is needed to substantiate and refine this information, so that cutting practices in the national forests of the region may be modified to result in the minimum loss by interception consistent with maintenance of soil stability and timber production.

As a result of studies of water consumption of riparian vegetation in canyon bottoms in California some water companies and owners of water rights have adopted the practice of removing the vegetation in order to conserve water. This practice is spreading to other sections.

On the other hand some preliminary results from the southwest and southern Idaho indicate that the consumption of water by grass and shrubs is very little greater than evaporation losses from soil kept bare of vegetation. The protection against soil movement afforded by the vegetation and its effect in reducing summer floods fully offsets the differential in water losses.

Lysimeters, some of large size to obtain the effects of groups of normally associated plants, have been developed using both natural and artificial soils. Observations have led to the tentative conclusion that under arid conditions vegetated soils do not lose as much water as bare soils.

### Project 4. Effect of forests on climate:

Determining the influence of forests on the elements of local climate, chiefly temperature, humidity, and wind movement is the principal objective of this study. One major phase is to determine the effect of cover conditions on snow melt and frost depth. Results from this work have been of enormous value to the flood control studies in the northern portions of the country.



Some of these studies have indicated that the conversion of mixed hardwood-conifer stands to pure conifer in forests intended for watershed protection is not good practice because snow is more evenly distributed and the soil freezes less in the mixed stands. Further, apparently, the frost goes out of the soil earlier in the spring under forest than elsewhere, the water from the melting snow being released gradually rather than suddenly as is the case on open lands.

In most of these studies records over an extended period are necessary, hence observations will be continued. Climatic records taken in connection with other related forest research projects are also analyzed under this project.

### SUPPLEMENTAL FUNDS

#### Direct Allotments

Projects	Allotments, 1941	Estimated allotments, 1942
<u>Emergency Relief, Agriculture,</u> <u>Forest Service (Transfer from WPA):</u> For projects in connection with forest influences investigations:		
1. Influence of forests on streamflow investigations .....	\$57,500	\$10,700
2. Investigation of utilization of water by trees .....	8,000	1,585
3. Investigation of stabilization of soils .....	12,500	2,150
4. Investigation of effect of forest cover on climate .....	5,849	700
Total above projects .....	83,849	15,135
Administrative funds included above ...	700	---
Total, Supplemental Funds (Direct Allotments) .....	83,149	15,135



(m) FOREST FIRE COOPERATION

Appropriation Act, 1942	\$2,425,000
Budget estimate, 1943	<u>2,500,000</u>
Change from 1942:	
Net increase in working funds	<u>\$ + 75,000</u>

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Cooperation with States in forest fire prevention and suppression .....	\$2,141,440	\$2,372,210	\$2,447,210	+\$75,000 (1)
2. Taxation inquiry and insurance .....	44,960	45,000	45,000	...
Transfers as shown in budget schedules .....	10,000	7,790	7,790	...
Unobligated balance .....	3,600	...	...	...
Total .....	2,200,000	2,425,000	2,500,000	+ 75,000

INCREASES

(1) An increase of \$75,000 to extend cooperative protection against forest fires to unprotected private forest lands and to increase the adequacy of protection given to State and private lands now under some form of organized protection.

Objective: To more adequately protect from fire State and privately owned forest lands.

The problem: The Federal Government now cooperates with 42 States and Hawaii in protecting 281 million acres. Such protection has been effective, but the standard of protection on a large proportion of the area is too low and needs strengthening. 147 million acres - an area more than 3-1/2 times larger than New England - is without any protection to speak of. The problem accordingly resolves itself on a two-fold basis- (1) Increasing the effectiveness of effort on protected areas, and (2) Extending protection to areas which are at present unprotected.

Significance: Forest conservation begins with protection of the forests from fire. Fire is the greatest single agency in the destruction of the nation's forest resource. Approximately ten times as much area is burned on unprotected State and private forest lands as on those areas which are protected. This despite the fact that the protected area is twice the size of the unprotected lands. The present tremendous losses from fire can be reduced only by the extension of adequate forest fire protection to cover all forest lands. Federal aid is both warranted and needed for this important work.





All States cooperate in this program with the exception of Arizona, Wyoming, Nebraska, Kansas, Iowa, and North Dakota. Utah initiated participation during fiscal year 1942.

Plan of work: The increase will be used to give better protection to areas now inadequately protected and to extend protection into some parts of the vast unprotected areas.

#### WORK UNDER THIS APPROPRIATION

Objective: To expand and increase the adequacy of existing protection from forest fires of 428 million acres of forest and watershed land which are in State and private ownership. Also to aid States and local governments to achieve more equitable and appropriate taxation of forest lands and to make forest insurance available at reasonable cost.

The problem and its significance: More than one-third of the large amount of forest land in State and private ownership is not now under any form of organized protection. The problem is to put this unprotected land under protection as well as to raise the standard of protection on areas now under protection.

Protection from forest fire is the first requisite in the conservation of the forest resource. The absence of fire control means the sacrifice of valuable resources. Each year some 200,000 forest fires occur on state and privately owned forest lands. During 1940 there were 181,352 fires--the average for the five-year period 1936-1940 was 199,588. In 1940, the fires on unprotected areas constituted 60% of the total number of fires, but the important factor is that 89% of the area burned and 82% of the damage suffered was on the unprotected lands.

Federal leadership is the backbone of the entire program of cooperative forest fire protection and Federal aid is essential. It stimulates State legislative action and gives stability to trained protection organizations. The fire protection job is a public responsibility and public administration, involving police powers of the State, alone can promise success with economy. The appropriations made by the States and the contributions by private land owners have made steady and substantial increase but the Federal Government in its participation has not kept pace.

Consideration must be given to the importance of the Nation's forest resource in national defense. Losses through forest fires will bring far-reaching implications in national welfare and defense.

The tax problem is generally recognized as ranking next to the fire problem in importance as affecting management of private forest lands. In many localities present methods of taxation discourage or prevent the practice of forestry on these lands.



The risk of loss from fire has been reduced in many localities by prevention and suppression efforts to insurable proportions so that the provision of a system of forest insurance against fire, and possibly against other natural hazards, is a feasible undertaking. There is pressing need for such a system in order to safeguard private investments in forestry enterprises and make them more attractive to private capital.

General plan: The cooperative fire protection program is administered on the ground by the States under plans developed jointly by Federal and State officers. Each State annually presents a budget showing State and other funds set up for the work. Adequate protection involves organizing men, equipment, and materials for the prevention and suppression of forest fires. It requires educational work and in so far as practicable the reduction or elimination of abnormal fire hazards; the quick detection of fires through the operation of lookout towers and the employment of fire patrolmen; the suppression of fires (involving stand-by crews, the development and use of mechanized equipment, and at times the employment of very large numbers of men), and the establishment of necessary improvements for communication and transportation. Adequate inspection is made by the United States Forest Service to see that high standards of organization and compliance are maintained. Grants to the individual States are made on a reimbursement basis, that is, expenditure must be made by the State before any reimbursement is granted. Every dollar given in grant by the Federal Government must be matched by the State.

The taxation and insurance activities have both been carried through initial stages of developing fundamental principles and methods. Taxation studies are now directed to application of these principles and to new angles of the problem. Most field investigations are made at the request of State officials, and all studies are closely integrated with other forest economics research. Forest insurance activities, in default of action by private insurance companies, are now directed chiefly to determining the feasibility of providing such insurance through existing governmental agencies.

#### Examples of progress and current program

##### Project 1. Payments to States for cooperative forest fire prevention and suppression

Under authorization of Section 2 of the Clarke-McNary Law continued progress was made in cooperating with 42 States and Hawaii in the protection of 281,835,140 acres of State and privately owned forest lands from forest fires--an increase of approximately 3 million acres over the previous year. Organized fire protection is still lacking on 146,748,388 acres.

This law, now 17 years old, continues to be a most effective and popular one. The poorer forestry States are enabled by these Federal allotments to extend their fire control activities and place more forest





acres under protection. In the better financed forestry departments the Federal assistance enables them to intensify their work and thus secure a greater reduction in forest fire losses. Of the \$9,028,986 spent last year protecting non-Federal lands, 52% was provided by the States; 25% by private forest owners; and 23% by the Federal Government under this program. The Clarke-McNary Law authorizes 50-50 Federal participation.

## Project 2. Forest taxation and insurance investigations

Examples of legislation to which taxation studies have contributed are the recent Mississippi law substituting a severance tax for the property tax on all standing timber in the State. This law, which was formulated by a committee on which the Taxation staff was represented, has just been tested by one complete year of operation with results which the State Tax Commission regards as satisfactory. Another example is the adoption in 1941 by the State of Washington of a special forest tax law based on the deferred timber tax plan which was recommended as a result of taxation studies on the West Coast. The prospects for other legislation growing out of application studies is encouraging, in spite of adverse circumstances.

The taxation staff has been able to make an important contribution to formulating the Department's policy regarding payments in lieu of taxes on the conservation lands under its jurisdiction. It was able to do so because of its detailed studies of the national forest aspect of the problem, which is directly related to taxation of forest lands because of the bearing of national forest payments on the sums which must be raised by local taxation in the many districts containing national forests. These studies are being used as a basis for departmental reports on numerous bills dealing with this subject which are before the current session of Congress. The problem of payments in lieu of taxes will undoubtedly call for further contributions from the Taxation staff, the extent of which depends in part on the extent to which new aspects emerge requiring further study, and more largely on the action taken by Congress on this highly controversial question.

A technique has been developed and tried out in Mississippi, Alabama, and Louisiana for building up a forest tax index series as similar as circumstances permit to the farm tax index which has for some time been reported by the Bureau of Agricultural Economics. Since the methods used by that Bureau in obtaining farm tax data could not, for a number of reasons, be paralleled for forest tax data, it was necessary to devise an appropriate procedure which could be carried out at very moderate expense. Excellent cooperation from State forest agencies and from the Forest Service regional organization has made this work possible. There is a real demand for information on the level of forest taxes and their trend in different areas which is met by this project, and the first releases led to many requests for its extension to other States. Under existing limitations, expansion of this work will have to come mainly through enlisting still wider cooperation and spreading technical guidance as thin as possible.





STATE ALLOTMENT DATA  
FOREST FIRE COOPERATION UNDER SECTION 2 OF THE CLARKE-McNARY LAW

State	State and private funds budgeted, fiscal year 1942	Federal allotments fiscal year 1942
Alabama	\$205,045	\$65,591
Arkansas	159,533	65,787
California	1,327,124	258,642
Colorado	26,191	5,111
Connecticut	81,833	17,261
Delaware	7,640	2,087
Florida	308,480	119,368
Georgia	180,726	79,273
Idaho	197,563	54,230
Illinois	38,175	6,336
Indiana	86,724	10,777
Kentucky	20,440	20,440
Louisiana	236,221	64,278
Maine	135,041	50,815
Maryland	<u>1/</u> 75,376	14,067
Massachusetts	165,603	35,428
Michigan	526,771	136,100
Minnesota	288,266	99,711
Mississippi	117,303	52,209
Missouri	27,112	16,310
Montana	114,043	27,445
Nevada	8,643	2,420
New Hampshire	133,956	18,545
New Jersey	167,646	36,250
New Mexico	18,324	3,990
New York	430,865	71,077
North Carolina	142,248	71,192
Ohio	38,829	7,980
Oklahoma	27,065	26,000
Oregon	929,269	157,354
Pennsylvania	259,172	48,398
Rhode Island	33,230	2,559
South Carolina	204,089	57,038
South Dakota	2,583	1,121
Tennessee	70,478	36,120
Texas	109,473	50,370
Utah	2,375	2,000
Vermont	28,282	6,538
Virginia	101,492	39,908
Washington	<u>1/</u> 1,286,016	197,000
West Virginia	172,500	35,529
Wisconsin	463,619	93,381
Hawaii	<u>7,745</u>	<u>1,229</u>
Total allotment to States	8,963,109	2,167,265
Administration, Inspection, & Contingent Expense		212,735
Forest Taxation		45,000
		- - - - -
Total appropriation . . . . .		\$2,425,000

1/ 1940 figures



(n) NEW ENGLAND HURRICANE DAMAGE

PROJECT STATEMENT

Project	1941	1942 (estimated)	1943 (estimated)
For rehabilitation and re-establishment of forest protection improvements, reduction of fire hazards, and prevention of forest fires, New England States ..	\$798,875	- -	- -
1939 appropriation available in 1941 .....	-869,236	- -	- -
Unobligated balance .....	+370,361	- -	- -
Total	300,000	- -	- -

WORK UNDER THIS APPROPRIATION

The special program provided by a \$5,000,000 deficiency appropriation in the fiscal year 1939, and augmented by a \$300,000 appropriation in the regular appropriation act for the fiscal year 1941, for fire prevention and hazard reduction on State and private lands in the New England states, was discontinued on June 30, 1941. While the fire hazard resulting from windthrown timber in the hurricane area is higher than normal and will continue at a high level for several years, the additional expenditures to meet this condition are being absorbed by the States and private owners.



(C) FOREST FIRE CONTROL (EMERGENCY)

Appropriation Act, 1943	\$1,100,000
Budget estimate, 1943	<u><u>- -</u></u>

PROJECT STATEMENT

Project	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. For forest fire control (emergency)	- -	\$ 1,100,000	- -	-\$1,100,000 (1)

DECREASE

(1) No provision has been made in the regular Budget for the continuance of this program. If continued because of the present war emergency it will presumably be financed through a special appropriation.

WORK UNDER THIS APPROPRIATION

Objective. To provide additional protection from forest fires to important defense industries and to lifelines of power, transportation, communication and raw materials serving those industries.

The problem and its significance. Many defense industries, particularly on the West Coast, are located in close proximity to forested areas and for that reason are subject to serious disruption of production schedules in the event of serious fires.

Plan of work. Special fire control programs were inaugurated in the three Pacific Coast States on National Forest, State, and private forest lands immediately after the special appropriation became available on July 3, 1941. Fire control forces were also strengthened in the New England and Middle Atlantic States during the fall fire season in that area. Sufficient reserves of allotments have been set aside to continue the special programs during the fall fire season in that area. Sufficient reserves of allotments have been set aside to continue the special programs during the spring season on the West Coast. Smaller reserves are available for special efforts in the East.





(P) ACQUISITION OF LANDS FOR NATIONAL FORESTS

Appropriation Act, 1942 .....	\$1,797,348
Budget estimate, 1943 .....	<u>354,210</u>
Change from 1942:	
Net reduction in working funds .....	-1,447,348
Additional for administrative promotions .	<u>4,210</u>
	<u><u>1,443,138</u></u>

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Acquisition of lands for national forests	\$921,500	\$1,708,000	\$290,652	-\$1,417,348 (1)
2. Transfers as shown in Budget schedules	77,500	89,348	59,348	- 30,000 (1)
3. Net cost of within-grade promotions	---	---	4,210	+ 4,210
Unobligated balance	1,000	---	---	---
Total	1,000,000	1,797,348	354,210	- 1,443,138

(1) In view of wartime needs, the estimate for 1943 contemplates suspension of land acquisitions under this item, with a decrease in working funds of \$1,447,348. The \$354,210 remaining is the amount required to perform the work necessary to consummate in the fiscal year 1943 the purchase of lands contracted for purchase in 1942 and prior years, but which will not be vested in Federal ownership prior to the close of the fiscal year 1942; and to otherwise maintain the continuity of the long established organization.

WORK UNDER THIS APPROPRIATION

General: The work under this appropriation is concerned with the acquisition of land by the Government for national forest purposes under authority of the Act of Congress of March 1, 1911 (36 Stat. 961), as amended particularly by the Act of June 7, 1924 (43 Stat. 653).

Objective: Over the long-term the objective of this appropriation is to vest in Federal ownership (a) all lands chiefly valuable for forest purposes within 77 national forest purchase units in 31 States and Puerto Rico, established under the provisions of the aforementioned Acts, and (b) lands in other areas which should be Federally owned and managed, and to so protect and manage such lands as adequately to safeguard the watersheds of navigable rivers and streams, and insure future timber supplies. Rehabilitation of blighted regions, stabilization of industries and communities; provision of employment opportunity; and perpetuation and protection of scenic and wildlife resources, are collateral consequences of the basic purposes.



The problem and its significance: Within the 48 States there are approximately 630,000,000 acres of land which evidently are more valuable for the production of forests and allied uses than for any other permanent economic service. Because of their very vital relationship to the economic welfare of the Nation, as major watersheds and sources of timber supply for future needs, their proper protection and management is of primary importance to the country.

Misuse of privately owned lands on the headwaters of navigable rivers through heavy cutting of timber, overgrazing, improper cultivation, and the destructive forces of fire, insects, and disease contributing to the denudation of forest lands have greatly impaired the absorptive capacity of the soil of much of this land, thereby contributing to floodwater conditions and siltation of river channels. The restoration of forest lands to their natural state and normal high capacity to absorb precipitation is essential to the maintenance of the navigability of rivers.

Future availability of supplies of commercially usable timber adequate to national needs can be assured only by effective protection of all existing virgin and advanced second-growth forests from denudation by destructive forces, excessive cutting and general waste. Optimum restoration of forest cover, by natural methods of reproduction or by planting, is essential on all other lands chiefly valuable for the growing of trees.

The economic destinies of some millions of people, including scores of thousands of families dependent upon submarginal farmlands, residing within or contiguous to the forest areas, are inseparably linked with such areas, and will depend in large measure upon an associated utilization of the forest resources. They will be deprived of a major influence favorable to the solution of their individual and collective problems if the forest lands are not adequately protected and constructively managed.

Private ownership of a great portion of the lands under consideration creates definite conflicts between the financial interests and property rights of the individual owner of land and the broad requirements of collective interest and welfare. Some of the most important services of forest lands cannot be financially capitalized by the private owner of the forest; that is, they make no direct cash returns to the landowner. Their realization may necessitate additional costs of protection and management, the waiver of immediate or maximum monetary returns. Few private owners voluntarily will forego pecuniary benefits or assume additional and uncompensated costs. This situation confronts the Nation with the alternatives of: (a) direct regulation of the use and management of private forests, under new principles of public cooperation involving increased public contributions to equalize additional elements of cost or loss, or (b) public acquisition and management of such parts of the forest area as will not, in private ownership, finance the costs of their adequate protection and management to the degree dictated by broad considerations of public welfare and interest.



Plan: The work under this project consists of vesting in Federal ownership those lands within the 77 purchase units that are offered for sale to the United States and which are chiefly valuable for forest purposes.

Progress and current program: The following table shows the progress that has been made in the acquisition of lands by the United States in the 77 established units and the approximate remaining acreage necessary to be acquired to attain the objectives of the project:





Progress and Current Program

	6/30/40 (acres)	Progress or changes in 1941 (acres)	6/30/41 (acres)	Progress estimated in 1942 (acres)	Estimated status 6/30/42 (acres)
1. Gross area of units	52,531,874	408,144 <sup>2</sup> / <sub>1</sub>	52,940,018	-	52,940,018
2. Less area non-purchasable	<u>8,175,716</u>	<u>-592,248<sup>1</sup>/<sub>1</sub></u>	<u>7,483,468</u>	-	<u>7,483,468</u>
3. Total acquirable area in units	44,356,158	1,100,392	45,456,550 <sup>1</sup> / <sub>1</sub>		45,456,550
4. Area in Federal ownership or in process of acquisition	<u>20,742,017</u>	303,022	<u>21,045,039</u>	215,000 <sup>3</sup> / <sub>1</sub>	<u>21,260,039</u>
5. Area remaining to be purchased	23,614,141		24,411,511 <sup>1</sup> / <sub>1</sub>		24,196,511
6. Estimated cost of Item 5	\$123,378,836		\$128,575,551 <sup>1</sup> / <sub>1</sub>	\$870,000 <sup>3</sup> / <sub>1</sub>	\$127,705,551
7. No. of Purchase Units in Project	76	+1 <sup>2</sup> / <sub>1</sub>	77	-	77

NOTES: 1/ The increase in total acquirable area in the units and the estimated cost to purchase the remaining area 6/30/41 over the figures for 6/30/40 is due in part to a reclassification of lands formerly classified as being non-purchasable. The reclassification of lands and increase in estimated cost to purchase is due to changing conditions within the units and slight upward trend of land prices. Lands that, at the time of the establishment of many units, were considered more valuable for farming, grazing, etc., have now become submarginal, heavily eroded, etc., and should be acquired and brought under the forestry program.

2/ Two new units were established in 1941 and one unit (Sequoia National Forest) has been re-grouped under the project "Acquisition of Lands for National Forests (Receipts Limitations)"

3/ Additional to 109,908 acres, \$458,665 acquired under the appropriation but approved for purchase in fiscal year 1941



venues: Fees from the sale of timber, grazing, special uses, and other sources approximating \$1,495,500 were collected from the 77 national forests and purchase units under this project and deposited in the Treasury in the Fiscal Year 1941. Twenty-five percent of this sum will be returned to the counties in which the forests are located for maintenance of schools and roads and 10 percent will be used for national forest roads. The annual revenue has been progressively increasing and is expected to continue to increase as the lands bought years ago begin to produce returns from maturing timber and other resources which have been developed or renewed by proper protection and management.

(q) ACQUISITION OF LAND FROM NATIONAL FOREST RECEIPTS (RECEIPT LIMITATION)

Appropriation Act, 1942	\$316,000
Budget estimate, 1943	---
Change from 1942:	
Net reduction in working funds	<u>316,000</u>

PROJECT STATEMENT

Project	1941	1942 (estimated)	1943 (estimated)	Decrease
Acquisition of lands in:				
1. Uinta and Wasatch National Forests (Utah)	\$39,702	\$40,000	---	- \$40,000 (1)
2. Cache National Forest (Utah only)	5,892	10,000	---	- 10,000 (1)
3. San Bernardino-Cleveland National Forests (Riverside County, California, only)	---	30,000	---	- 30,000 (1)
4. Nevada-Toiyabe National Forests (Nevada)	9,694	10,000	---	- 10,000 (1)
5. Ozark-Ouachita National Forests, (Arkansas only)	---	150,000	---	- 150,000 (1)
6. Angeles National Forest (California)	---	35,000	---	- 35,000 (1)
7. Cleveland National Forest (San Diego County, California, only)	---	6,000	---	- 6,000 (1)
8. Sequoia National Forest, California	---	35,000	---	- 35,000 (1)
Unobligated balance	15,712	---	---	---
	71,000	316,000	---	- 316,000

DECREASE

(1) In view of wartime needs the entire appropriation is eliminated in the fiscal year 1943.



WORK UNDER THIS APPROPRIATION

The appropriation of all or certain percentages of the receipts from eleven national forests, as above listed, has been authorized for the acquisition of lands therein. Normally, of the receipts so appropriated 25 percent would be returned at the close of each fiscal year to the States for use by the counties within the forests for school and road purposes; an additional 10 percent would be made available for the construction and maintenance of roads and trails.

The following table shows the land approved for purchase in 1941 and the estimated acreage to be approved in 1942; the remaining acreage to be acquired, as of June 30, 1942, and the estimated cost thereof, at such times as conditions permit the resumption of this activity.

	Acreage approved for purchase in 1941 and estimated to be ap- proved in 1942	Remaining acreage to be acquired, as of June 30, 1942	Estimated cost
Project 1. Uinta-Wasatch National Forests (Utah)	23,525	68,716	\$216,202
Project 2. Cache National Forest (Utah)	4,327	125,673	342,784
Project 3. San Bernardino-Cleve- land National Forests (Riverside County) Cal.	10,000	72,000	543,000
Project 4. Nevada-Toiyabe National Forests (Nevada)	5,629	52,740	163,112
Project 5. Ozark-Ouachita National Forests (Arkansas)	35,317*	957,975	3,842,000
Project 6. Angeles National Forest, California	1,500*	26,500	595,000
Project 7. Cleveland National For- est (San Diego County) California	600*	90,400	904,000
Project 8. Sequoia National Forest, California	4,000*	42,000	765,000

\*Initial appropriation made in 1942





The acreage listed in the foregoing table as "remaining to be acquired" is the known private land within the units. Some of these lands are being well managed and may not have to be acquired by the Government if their present policies of management continue; other lands are not so strategically located as to make their acquisition by the Government imperative. Additionally, there are indications that, because of the strong local interest in the communities within and adjacent to the Cache National Forest for bringing the lands in that project under Federal administration, the communities are willing to acquire as much of the private lands as they can afford to and donate them to the Government. For these reasons, the amount of land that the Government will have to buy in the future in each project to attain the objectives may be materially reduced, with an attendant reduction in the amount of Federal funds that will have to be used to consummate the acquisition program.

(r) PAYMENTS TO STATES AND TERRITORIES, NATIONAL FORESTS FUND

Appropriation Act, 1942 (revised)	\$1,525,306
Budget estimate, 1943	<u>1,525,306</u>

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
Payments to States and Territories from national forests funds	\$1,432,581	\$1,525,306	\$1,525,306	---
Total	1,432,581	1,525,306	1,525,306	---

WORK UNDER THIS APPROPRIATION

The law requires that 25 percent of all money received from the national forests during any fiscal year be paid to the States and Territories in which the forests are located. The amount of this appropriation varies each year in direct proportion to national forest receipts during the previous fiscal year. Increases in this appropriation are offset by additional revenue to the Federal Treasury.



(s) PAYMENTS TO SCHOOL FUNDS, ARIZONA AND NEW MEXICO  
NATIONAL FORESTS FUND

Appropriation Act, 1942	\$23,392
Budget estimate, 1943	<u>23,392</u>

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)
Payments to school funds, Arizona and New Mexico, national forests fund	\$23,392	\$23,392	\$23,392
Total	23,392	23,392	23,392

WORK UNDER THIS APPROPRIATION

Objective: To reimburse the States of Arizona and New Mexico such proportion of the gross proceeds of all the national forests within those states as the area of land granted to the States for school purposes within the national forests bears to the total area of all national forests within the states.

Significance: These payments are required by the Act of June 20, 1910 (36 Stat. 562 and 573) which provides "That the grants of Sections two, sixteen, thirty-two and thirty-six to said State, within national forests now existing or proclaimed, shall not vest the title to said section in said State . . . but said granted sections shall be administered as a part of said forests, and at the close of each fiscal year there shall be paid to the Secretary of State, as income for its common-school fund, such proportion of the gross proceeds of all the national forests within said State as the area of lands hereby granted to said State for school purposes which are situated within said forest reserves . . . may bear to the total area of all the national forests within said State . . . the amount necessary for such payments being appropriated and made available annually from any money in the Treasury not otherwise appropriated."

School lands are given the same form of management accorded adjacent national forest lands.

Plan and progress of work: As soon after the close of the fiscal year as the receipts from national forests, and the area of school lands in the States of Arizona and New Mexico are authoritatively determined, the payments referred to above are made to the states. Payments in fiscal year 1941 were \$22,958 to Arizona and \$434 to New Mexico.



(t) ROADS AND TRAILS FOR STATES, NATIONAL FORESTS FUND

Appropriation Act, 1942 (revised)	\$618,387
Budget estimate, 1943	<u>618,387</u>

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)
Roads and Trails for States, national forests fund;	\$462,579	\$618,387	\$618,387
1940 appropriation available in 1941	- 523,125	---	---
1941 appropriation available in 1942	633,578	-633,578	
1942 appropriation available in 1943	---	633,578	- 633,578
Unobligated balance	---	---	633,578
Total	573,032	618,387	618,387

WORK UNDER THIS APPROPRIATION

An additional 10 percent of all moneys received from the national forests during each fiscal year is available at the end thereof to be expended by the Secretary of Agriculture for the construction and maintenance of roads and trails within the national forests in the States from which such proceeds are derived. (16 U.S.C. 50).





(u) COOPERATIVE WORK, FOREST SERVICE  
(TRUST ACCOUNT)

Appropriation Act, 1942	\$1,000,000
Budget estimate, 1943	<u>1,000,000</u>

PROJECT STATEMENT

Project	1941	1942 (estimated)	1943 (estimated)
1. Construction of improvements .....	\$277,139	\$368,000	\$368,000
2. Maintenance of improvements .....	97,574	78,000	78,000
3. Prevention and suppression of forest fires	295,267	233,000	233,000
4. Disposal of brush and other debris in timber-sale operations .....	300,452	237,500	237,500
5. Forest investigations .....	44,621	35,500	35,500
6. Administration .....	38,828	31,000	31,000
7. Reforestation .....	33,172	15,000	15,000
8. Refunds to cooperators .....	9,734	2,000	2,000
Total obligations .....	1,096,787	1,000,000	1,000,000
1940 appropriation available in 1941 .....	-1,153,423	- -	- -
1941 appropriation available in 1942 .....	+1,727,080	-1,727,080	-1,727,080
1942 appropriation available in 1943 .....	- -	+1,727,080	+1,727,080
Unobligated balance .....	- -	- -	- -
Total .....	1,670,444	1,000,000	1,000,000

WORK UNDER THIS APPROPRIATION

Contributed funds are placed in this trust account, to facilitate the accomplishment of certain projects within the list of activities shown in the project statement, which are of mutual benefit to the Forest Service and to individuals, other public or private agencies, or organizations; to provide for the equitable division of the cost of projects; and to simplify completion by concentrating the direction of the projects under one head.

Many desirable proposed projects are of potential benefit to both the Forest Service and a second party. It is in the public interest to see that the other party or parties defray their fair share of the expense of such projects. This is especially true in the case of fire prevention and suppression on private lands intermingled with National Forest land inasmuch as the Government must necessarily suppress fires on nearby lands regardless of ownership in order to protect its own property. In the case of brush disposal on National Forest timber sales, this method of collecting from the operator as he cuts the timber insures the proper disposal of the debris resulting from the sale.

This authorization provides an efficient method of collecting a proportionate part of the cost of projects from other agencies, organizations, or individuals when intermingled interests dictate that their share of the benefit justifies their participation in the expense.



The terms under which cooperative projects are undertaken are reduced to writing and are signed by both parties. In the case of brush disposal, however, the contract for the sale of timber outlines the cooperative arrangement between the Government and the operator.

Progress and current programs:

The most satisfactory way of showing trends in this appropriation is through a comparison of total deposits by years. A table showing deposits in the fiscal years 1940 and 1941 is given below:

<u>Projects</u>	<u>1940</u>	<u>1941</u>	<u>Increases</u>
Construction and maintenance of improvements (includes roads) .....	\$420,966	\$601,497	\$180,531
Prevention and suppression of forest fires	377,657	429,888	52,231
Disposal of brush and other debris in timber sale operation .....	205,077	528,954	323,877
Forest investigation .....	17,575	37,320	19,745
Administration .....	30,168	59,160	28,992
Reforestation .....	9,619	14,340	4,721
Totals .....	1,061,062	1,671,159	610,097

SUPPLEMENTAL FUNDS

(Complete Bureau Statement)

(1) Direct Allotments

<u>Projects</u>	<u>Allotments, 1941</u>	<u>Estimated Allotments, 1942</u>	<u>Estimated Allotments, 1943</u>
1. <u>Special Research Fund, Department of Agriculture:</u> For special research on Bioclimatics and phenology .....	\$3,355	\$3,675	\$3,000
2. <u>Cooperative Farm Forestry, Department of Agriculture (Forest Service):</u>			
Cooperation with States in the procurement, protection, and distribution of forest tree and shrub seeds and plants for farmers .....	123,000	123,000	123,000
Cooperation with States in carrying out farm forestry operations, including intensive projects and technical service to legally competent and adequate organizations of farmers, and in farm forestry investigations .....	39,026	40,982	40,982



Projects	Allotments, 1941	Estimated Allotments, 1942	Estimated Allotments, 1943
Prairie States Forestry Project .....	- -	298,000	- -
Total, Cooperative Farm Forestry	162,026	461,982	163,982
3. <u>Conservation and Use of Agricultural Land Resources</u> : For administration of naval-stores conservation program .....	34,540	53,818	48,700
4. <u>White Pine Blister Rust Control (Forest Service)</u> : For blister rust control on National Forests .....	644,000	685,668	1,044,000
5. <u>Flood Control, General (Transfer to Agriculture) (Forest Service)</u> . Preliminary examinations and surveys, and works of improvement for headwaters control including upstream engineering, soil stabilization and reforestation, on selected watersheds authorized by Flood Control Acts .....	2,154,197 <sup>1/</sup>	1,089,687 <sup>2/</sup>	449,100
6. <u>Golden Gate International Exposition (Transfer to Agriculture) (Forest Service)</u> : For expenses in connection with exhibit at Golden Gate International Exposition .....	318	- -	- -
7. <u>Loans, Grants, and Rural Rehabilitation, Agriculture, Forest Service, Assisting and Servicing Loans and Relief</u> . For administration, rural rehabilitation project .....	5,500	8,182	8,182
8. <u>Emergency Relief, Agriculture, Forest Service Administrative Expenses (Transfer from W.P.A.)</u> : For administrative expenses in connection with program of work under Emergency Relief Appropriation Act of 1940 and 1941 .....	170,427	36,207	- -
9. <u>Emergency Relief, Agriculture, Forest Service, Federal Non-Construction Projects, and Federal Construction Projects (Transfer from W.P.A.)</u> . For conservation of forest resources, surveys and mapping, and development of campgrounds .....	4,353,556 <sup>3/</sup>	1,034,500 <sup>4/</sup>	- -

1/ Of which \$1,187,200 is estimated to be obligated in fiscal year 1942, and \$129,920 is estimated to be obligated in fiscal year 1943.

2/ Of which \$722,800 is estimated to be obligated in 1943.

3/ For allocation by States, see table which follows.

4/ For allocation by States, see table which follows.





Projects	Allotments, 1941	Estimated Allotments, 1942	Estimated Allotments, 1943
10. Emergency Relief, Agriculture, Forest Service, Planning and Review of W.P.A. Projects (Transfer from W.P.A.) .....	- -	6,420	- -
11. Emergency Fund for the President, National Defense (Allotment to Agriculture). For expenses of moving Forest Service Region 7 to Philadelphia, Pa. ....	- -	28,450	- -
12. Working Fund, Agriculture, Forest Service (Advance from "Acquisition of Land for Military Purposes, National Defense," War Department): For examination, appraisal, abstracting, and other expenses in connection with acquisition of privately owned lands within the Gasconade Division of the Mark Twain National Forest .....	50,000 <sup>1/</sup>	- -	- -
13. Working Fund, Agriculture, Forest Service (Advance from "Acquisition of Land, Choctawhatchee National Forest, Florida," War Department). For examination, appraisal, abstracting and other expenses in connection with the acquisition of privately owned lands within the Choctawhatchee National Forest .....	25,000	- -	- -
14. Working Fund, Agriculture, Forest Service (Advance from "Construction of Buildings, Utilities and Appurtenances at Military Posts," War Department). To cover expenses in connection with appraisal of lands to be acquired for the Camp Polk Artillery Range, Louisiana .....	6,934 <sup>1/</sup>	- -	- -
15. Working Fund, Agriculture, Forest Service (Advance from Central Valley Project, California) (Transfer from Interior Department). For reconstruction of Forest Service facilities within the Shasta Reservoir, necessitated by construction of the Shasta Dam, California .....	204,093 <sup>1/</sup>	54,847	- -

<sup>1/</sup> Available until expended.



Projects	Allotments, 1941	Estimated allotments, 1942	Estimated allotments, 1943
16. <u>Working Fund, Agriculture, Forest Service (Advance from "Acquisition of Land for Military Purposes, National Defense," War Department).</u> For examination, appraisal, abstracting, and other expenses in connection with acquisition of privately owned lands within the boundaries of the De Soto National Forest, Mississippi .....	6,000 <sup>1/</sup>	- -	- -
17. <u>Working Fund, Agriculture, Forest Service (Advance from Department of Justice).</u> For prosecution of case against Northern Pacific Railway Co.	8,983	- -	- -
18. <u>Working Fund, Agriculture, Forest Service, 1941 (Advance from "Aviation, Navy, 1941" Navy Department).</u> To provide necessary services for boundary and topographic surveys of an area within the Croatan National Forest at Cherry Point, Neuse River, North Carolina, in connection with the development of a Marine Aviation Field	5,000	- -	- -
19. <u>Working Fund, Agriculture, Forest Service (Advance from Federal Power Commission).</u> To cover non-personal expenses incident to the investigation and supervision of Federal Power Commission projects .....	1,200	1,200	1,200
20. <u>Working Fund, Agriculture, Forest Service (Advance from Revested Oregon and California Railroad and Reconveyed Coos Bay Wagon Road Grant Lands, Oregon) (Transfer from Interior Department):</u> To cover expenses in connection with the protection of forest values against fire and trespassing on 590,683 acres, Oregon and California lands lying within the boundaries of the national forests .....	19,493	19,493	19,493
21. <u>Working Fund, Agriculture, Forest Service.</u> For construction of dams, roads, buildings, fences, and other improvements on lands transferred to Forest Service under authority of Farm Tenant Act .....	9,007	- -	- -
Total, Supplemental Funds (Direct Allotments) .....	7,863,629	3,484,129	1,737,657

<sup>1/</sup> Available until expended.



(a) Emergency Relief Funds (Item 9) obligated in 1941 as follows:

<u>States, etc.</u> <u>Project Funds</u>	<u>Allotments</u>	<u>States, etc.</u> <u>Project Funds</u>	<u>Allotments</u>
Alabama	\$71,000	Nevada	\$37,769
Arizona	86,106	New Hampshire	4,232
Arkansas	46,858	New Mexico	142,725
California	308,481	North Carolina	31,451
Colorado	263,180	North Dakota	334,738
Connecticut	4,398	Ohio	7,197
Florida	40,918	Oklahoma	285,007
Georgia	94,651	Oregon	139,532
Idaho	289,211	Pennsylvania	9,550
Illinois	9,650	South Carolina	15,000
Indiana	8,000	South Dakota	358,408
Kansas	379,702	Tennessee	15,000
Kentucky	18,652	Texas	242,560
Maine	2,445	Utah	172,978
Maryland	6,250	Virginia	26,235
Massachusetts	2,485	Washington	61,083
Michigan	48,400	West Virginia	24,426
Minnesota	36,820	Wisconsin	44,963
Mississippi	23,248	Wyoming	47,087
Missouri	107,266	Alaska	10,000
Montana	25,692	Puerto Rico	10,735
Nebraska	401,805	District of Columbia	51,662
		Total	4,353,556

(b) Emergency Relief Funds (Item 9) allocated in 1942 as follows:

Arizona	\$4,735	Minnesota	\$20,473
Arkansas	3,186	Missouri	148,837
California	17,000	Nebraska	153,920
Colorado	70,352	New Hampshire	2,129
Florida	1,980	North Dakota	109,550
Georgia	882	Oklahoma	105,700
Kansas	139,813	Pennsylvania	4,500
Maryland	1,000	South Dakota	140,510
Massachusetts	858	Texas	74,430
Michigan	6,127	Utah	26,018
		Puerto Rico	2,500
		Total	1,054,500

#### WORK UNDER EMERGENCY ALLOTMENTS

These allotments are used for such projects as the construction and maintenance of firebreaks, forest-fire lookout houses, towers and observatories, landing fields, telephone lines, forest roads and trails, housing for forest officers, miscellaneous buildings and structures, planting, maintenance of





tree nurseries, thinning of forest stands, fire prevention and control, fire-hazard reduction, construction and maintenance of improvements for recreational use of the forests, control of tree-destroying insects and diseases and of range-destroying rodents, eradication of poisonous range plants and revegetation of depleted ranges, construction and maintenance of range fences and other range improvements; surveys of forest resources such as timber, forage, water, wildlife, and related activities; surveys needed for forest activities, power-resource evaluation and appraisal, and development of the fish and game resources; studies relating to forest, range, and watershed management, protection, development, and utilization; and for other work and the purchase of equipment and supplies incident to or necessary in connection with any projects of the character indicated above.

SUPPLEMENTAL FUNDS - continued

(2) Allotments under Civilian Conservation Funds  
(financed by War Department)

Projects	Allotments, 1941	Allotments, 1942
Civilian Conservation Corps (Act of June 28, 1937, and supplemental acts; allotments through War Department)		
1. National forests	\$11,777,000	\$7,563,892
2. Alaska	494,000	480,886
3. State, municipal, and privately owned lands	9,317,000	4,994,454
4. Puerto Rico	1,005,000	1,019,906
Total, Civilian Conservation Corps Funds	22,593,000	14,059,138

Civilian Conservation Corps Activities (authorized by Act of June 28, 1937, and supplemental acts; allotment through War Department):

	<u>1941</u>	<u>1942</u> (estimated)
1. <u>Civilian Conservation Corps Work on national forests (includes a small number of miscellaneous camps)</u> .....	\$11,777,000	\$7,563,892

The number of camps on national forests on July 1, 1940, July 1, 1941, and authorized for operation after January 15, 1942 (all camps on national forests unless otherwise indicated) were:



	<u>July 1, 1940</u>	<u>July 1, 1941</u>	<u>January 15, 1942</u>
Alabama .....	4	3	3
Tennessee Valley Authority .....	4	3	3
Arizona .....	11	7	4
Arkansas .....	13	11	5
California .....	36	28	13
Colorado .....	10	6	4
Dist. of Columbia (Bur. of Plant Industry) .....	1	1	1
Florida .....	3	3	2
Georgia .....	5	4	3
Idaho .....	26	15	7
Bureau of Animal Industry .....		1	1
Illinois .....	4	3	2
Indiana .....	2	2	2
Kentucky .....	6	5	4
Louisiana .....	4	4	4
Michigan .....	23	18	11
Minnesota .....	15	12	6
Mississippi .....	7	7	6
Missouri .....	9	8	4
Montana .....	13	10	6
Bureau of Animal Industry .....	1	1	1
Nebraska .....	1	1	1
Nevada .....	2	2	1
New Hampshire .....	6	3	1
New Mexico .....	8	5	3
North Carolina .....	8	6	4
Tennessee Valley Authority .....	1	1	1
Ohio .....	2	2	1
Oklahoma .....	1	1	1
Oregon .....	17	13	3
Pennsylvania .....	3	2	1
South Carolina .....	5	4	2
South Dakota .....	7	5	2
Tennessee .....	4	4	3
Tennessee Valley Authority .....	11	10	3
Texas .....	6	5	2
Utah .....	8	4	2
Vermont .....	2	1	1
Virginia .....	10	8	6
Tennessee Valley Authority .....	2	1	-
Washington .....	16	10	5
West Virginia .....	5	4	3
Wisconsin .....	12	10	5
Wyoming .....	8	5	2
Cheyenne Horticultural (B.P.I.) .....	1	1	1
Total Camps .....	343	260	156



	<u>July 1, 1940</u>	<u>July 1, 1941</u>	<u>January 15, 1942</u>
Total, national-forest camps .....	322	241	140
Total, Tennessee Valley Authority camps	18	15	12
Total, Bureau Plant Industry camps ....	2	2	2
Total, Bureau Animal Industry camps ...	<u>1</u>	<u>2</u>	<u>2</u>
Total .....	343	260	156

#### WORK UNDER FOREGOING ALLOTMENT

This allotment is used for the pay of supervisory and facilitating personnel necessary for the field work done from C.C.C. camps mainly on the national forests; also for the purchase of necessary equipment and construction materials and for miscellaneous expenses incident to the field work of the camps. The field work on the national forests includes the construction of physical improvements needed for the protection and administration of the forests, tree planting, thinning of young stands of timber, destruction of undesirable timber species, rodent control, etc.

	<u>1941</u>	<u>1942</u> <u>(estimated)</u>
2. <u>Civilian Conservation Corps Work</u>		
<u>in Alaska</u> .....	<u>\$494,000</u>	<u>\$480,886</u>

#### WORK UNDER FOREGOING ALLOTMENT

This allotment (Alaska) is used for pay and allowances to dependents of enrolled members of the Civilian Conservation Corps and for salaries and wages of extra supervisory and clerical personnel needed in connection with the work. It is also used for the purchase of clothing, subsistence, supplies, and camp equipment required for enrolled men of the Corps and for the purchase of construction materials used in the work. Classes of work done under this allotment include construction of trails, minor roads, bridges, water development and improvement, and miscellaneous administrative improvements; roadside clearings and public campground improvement; estimating timber resources; and other miscellaneous work. The men engaged in the work are recruited from the unemployed local residents, including Indians, without regard to age.

	<u>1941</u>	<u>1942</u> <u>(estimated)</u>
3. <u>Civilian Conservation Corps Work on State,</u>		
<u>Municipal, and Privately Owned Forest Land</u> ...	<u>\$9,317,000</u>	<u>\$4,394,454</u>

Number of camps by States on July 1, 1940, July 1, 1941, and authorized for operation after January 15, 1942.

	<u>July 1, 1940</u>	<u>July 1, 1941</u>	<u>January 15, 1942</u>
Alabama .....	6	6	3
Arkansas .....	4	4	2
California .....	7	3	1





July 1, 1940   July 1, 1941   January 15, 1942

Connecticut .....	10	6	1
Florida .....	6	5	3
Georgia .....	6	4	2
Idaho .....	5	4	2
Illinois .....	1	1	1
Indiana .....	5	4	4
Iowa .....	3	2	1
Kentucky .....	6	4	3
Louisiana .....	5	3	2
Maine .....	5	3	1
Maryland .....	6	4	3
Massachusetts .....	12	7	1
Michigan .....	12	10	4
Minnesota .....	10	9	4
Mississippi .....	4	5	3
Missouri .....	3	3	1
Montana .....	1	1	1
Nevada .....	-	-	1
New Hampshire .....	5	2	-
New Jersey .....	10	7	4
New York .....	32	24	9
North Carolina .....	5	4	3
Ohio .....	5	4	3
Oklahoma .....	2	1	-
Oregon .....	9	6	3
Pennsylvania .....	33	24	14
Rhode Island .....	2	1	1
South Carolina .....	7	4	2
Tennessee .....	4	2	1
Texas .....	4	3	3
Vermont .....	6	3	-
Virginia .....	10	7	4
Washington .....	7	5	3
West Virginia .....	7	5	4
Wisconsin .....	<u>12</u>	<u>9</u>	<u>4</u>
Total camps on State lands, etc..	277	199	102

#### WORK UNDER FOREGOING ALLOTMENT

This allotment is used for the payment of expenses incurred in the conduct of Civilian Conservation Corps work on State, municipal, and privately owned lands, including the purchase of supplies, materials, and equipment used in the work, for payment of salaries and wages of supervisory personnel directing the work of the enrolled men, and for other necessary expenses incident to the work.

The work being accomplished under this allotment includes the protection of State and private forest land from fire by construction of firebreaks, lookout towers, communication systems, truck trails, tool sheds, guard houses,



and the fighting of forest fires; protection of State and privately owned forests from the epidemic spread of forest insects and tree diseases; forest cultural measures to improve the forest growth on State-owned lands; and the construction of simple dams and the planting of trees, grass, etc., for the control of erosion and flash runoff at the headwaters of streams.

	<u>1941</u>	<u>1942</u>
4. <u>Civilian Conservation Corps Work in</u>		
<u>Puerto Rico</u> .....	<u>\$1,005,000</u>	<u>\$1,019,906</u>

#### WORK UNDER FOREGOING ALLOTMENT

This allotment (Puerto Rico) is used for the payment of authorized enrollees and the supervisory personnel engaged in the technical direction of the work projects on the Luquillo National Forest and the insular forests and for the purchase of equipment and supplies incident to the work.

The work projects comprise the construction and maintenance of roads and trails, production of nursery stock, making new forest plantations and thinning old ones, forest thinnings to improve the timber stands within the national and insular forests, and development of a recreational area within the national forest. With a population of 1,500,000, the unemployment situation in Puerto Rico has been acute and, since the enrollment has been on a pro rata basis from the 72 insular municipalities, the C.C.C. work has played its part in giving a measure of relief. Camps are not established as they are in the States, since a large proportion of the enrollees live at home and go to and from the work projects.

#### PASSENGER-CARRYING VEHICLES

The authorization for the purchase of passenger-carrying vehicles for the Forest Service from appropriations other than Forest Roads and Trails provides for the replacement of 93 vehicles at an estimated cost of \$56,405 which is the same estimated cost in the authorization for the fiscal year 1942, when the exchange of 90 vehicles was contemplated.

From the appropriation Forest Roads and Trails an authorization which will provide for the replacement of 15 vehicles is recommended at an estimated cost of \$9,945, as compared with the replacement of 16 vehicles at an estimated cost of \$10,232 authorized for 1942.

While the 1943 purchase program calls for the replacement of 108 passenger vehicles, actually all of the old vehicles to be replaced may not be turned in on the purchase of new automobiles. It has been found to be more economical in some of the western regions, because of shop facilities and the difficulty of obtaining parts for some of the older cars, to dismantle the old automobiles, using the serviceable parts so far as possible in the repair of other passenger vehicles and disposing of the remainder through exchange in the purchase of new repair parts.



All of the old vehicles to be replaced, except 3, are of 1938 model or older, some being as old as 1932, but the majority are of 1937 model. These machines have been operated under practically all conditions of use but the greater portion of use has been over rough forest roads. The average mileage of the vehicles when replaced will be approximately 58,000. Three of the automobiles are 1939 model but because of exceptionally heavy use they should be replaced.





# FOREST ROADS AND TRAILS

(Carried under "General Public Works" in 1943 Budget)

Appropriation Act, 1942 ..... \$9,990,165

Budget estimate, 1943 ..... 6,500,000

Change from 1942:

Decrease ..... - 3,490,165

## PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Forest highways .....	\$6,285,000	\$6,994,000	\$3,200,000	-\$3,794,000 (1)
2. Forest road development .	2,715,000	2,996,165	3,300,000	+ 303,835 (2)
Total .....	9,000,000	9,990,165	6,500,000	- 3,490,165

## DECREASE

The decrease in working funds in the amount of \$3,490,165 consists of:

(1) A decrease of \$3,794,000 in "Forest highways".

This decrease will be met by limiting expenditures in the fiscal year 1943 to the liquidation of 1941 and 1942 program obligations; the construction or reconstruction of the most vital bridge projects on the strategic network of national defense highways; the continuance of three prison labor camps engaged on road construction; and to maintenance, surveys, and administration. No new construction except the bridges on strategic highways is planned.

(2) An increase of \$303,835 in the "Forest road development" project.

This increase is needed for the maintenance of existing truck trails and trails, because of the substantial reduction in the number of CCC camps on the National Forests. Reductions ordered to date call for the elimination of 132 National Forest camps (from 322 camps on February 1, 1941 to 140 on January 15, 1942).

The existing Forest Road Development transportation system consist of 93,946 miles of truck trails and 145,885 miles of foot and horse trails. The needs for the maintenance of existing improvements are so pressing that no money will be available from this appropriation for the construction of new projects, or the reconstruction of substandard truck trails and trails in the fiscal year 1943.



## CHANGES IN LANGUAGE

Two major changes in language in the 1943 appropriation act are included. The first would be added after the code citation in the second line of the item and reads as follows:

"and also for the construction, reconstruction, and maintenance of roads and trails on experimental areas under Forest Service administration."

This change in language will make the forest roads and trails appropriation available for the construction and maintenance of roads and trails on experimental areas in the same way that the National Forest Protection and Management appropriation is available for the construction and maintenance of all other classes of improvements on these areas. Many of these areas are poorly equipped with transportation facilities and some provision should be made for the construction and maintenance of roads and trails on them.

The second change, in the last proviso of the item, eliminates the authority for the purchase of land and the construction of a building at Missoula, Montana, and substitutes therefor authority to purchase land and buildings at Portland, Oregon. As revised, the proviso will read as follows:

"Provided further, That there shall be available from this appropriation not to exceed \$38,000 for the purchase of land and buildings at Portland, Oregon, for the storage and repair of Government equipment for use in the construction and maintenance of roads."

For several years the Forest Service has been leasing approximately 3-1/3 acres of land in the City of Portland, upon which are located two buildings containing 80,000 square feet of storage space and 5,000 square feet of office space. In addition there is available 1-1/4 acres of land which is used for the open storage of equipment.

The lease contains an option to buy the property for \$37,500. The authorization has been set at \$38,000 to provide for expenses incident to purchase. The annual rental now being paid is \$4,200. In view of the low price at which this property can be purchased, it is recommended that the authorization be approved.

Portland, Oregon, is the regional headquarters for the North Pacific National Forest Region, and the maintenance of shop and storage facilities will be permanently needed at that point. This establishment is now designated as a Departmental consolidated shop and serves all bureaus of the Department of Agriculture in the vicinity of Portland. This property is now being rented from the Portland Traction Company and was formerly known as the Sellwood shops and car barns. It is located within the corporate limits of the City of Portland. Both buildings are of brick construction--the office building being two stories in height and the shop and warehouse building one story.

The other changes in language are made to reflect the status of the road authorizations with reference to the 1943 appropriations.



Project 1. Forest highways.

WORK UNDER THIS APPROPRIATION

Objective: To improve the Forest Highway system which consists of forest roads which are of primary importance to the States, counties, or communities within adjoining, or adjacent to the national forests:

- (1) by maintaining Forest Highways which by the provisions of cooperative agreements are to be maintained by the Federal Government for the 2-year period following completion of construction.
- (2) by financing the construction of Forest Highways where urgent traffic needs exist.
- (3) by constructing or improving Forest Highways and bridges on routes necessary for National Defense.
- (4) by preparing for prompt award of future construction contracts through having complete and approved surveys, plans and estimates.

The problem and its significance:

Maintenance: Slide removal, additional drainage facilities, regrading of fills due to settlement and slough, and snow removal are necessary maintenance items existent in newly constructed highways for the safety and usability of the traffic and a protection of the investment.

Construction: The Federal Government has a definite obligation to the public to provide for adequate transportation routes within or adjoining the national forests which are necessary to the national forests and of primary importance to the states, counties, or communities. Where the improvements outside the Forests have kept pace with demands for interstate travel, deficiencies in the Forest Highway System not only affect the immediate locality, but the effect is country-wide in many cases.

Traffic often finds it desirable, when alternate routes exist, to bypass the national forests to avoid travel over inadequately constructed roads now existing throughout the forests. Many of the highways now existent were constructed when lower standards of width, speed and capacity were sufficient.

General plan:

Maintenance: The amount of forest highway maintenance to be done is dependent on the construction program of the previous years, particularly the previous 2 years. The cooperative agreements in practically all cases provide for Federal financing of maintenance for only the two-year period following completion of construction and for State and county





financing thereafter. However, occasionally and when the construction period extends over several years and road service is not given until the entire project is completed, the period of Federal financing is extended.

The estimate of necessary maintenance for fiscal year 1943 involves work on approximately 1,120 miles of Forest Highways.

Construction program: From the transportation plan prepared by the Forest Service careful consideration is given to those roads which legally qualify as Forest Highways and those of value to the national forests but of primary value to the States, counties and local communities. This planned system as of June 30, 1941 is as follows;

	<u>Miles</u>	<u>Percent</u>
Satisfactory standard	11,948	49
Unsatisfactory standard	11,137	46
Non-existing	<u>1,210</u>	<u>5</u>
Total	24,295	100

In order to complete the system, the construction program calls for the reconstruction or betterment of the 11,137 miles which are now existing but of inadequate standards in alinement, width, or grade to meet the present day requirements, and the construction of 1,210 miles of highways, where none now exist.

Examples of progress and current program:

Although approximately \$4,500,000 was expended for construction during fiscal year 1941, there was no advancement toward completing the system and in fact the accomplishments did not keep pace with the increase in requirements due to demands for higher standards, to increased traffic and heavier loads and to the addition of newly acquired forest land to be served by the planned Forest Highway system. It is estimated that 51 miles of Forest Highways will be constructed during the fiscal year 1943, from the requested appropriation.

Project 2. Forest development roads and trails.

Objective: The objective for the expenditure of this fund is to construct, reconstruct, and maintain truck trails and trails which are of primary importance for the necessary administration, protection, development, and utilization of national forest lands and their resources. The needs have been carefully studied and after scientific planning an overall transportation system has been approved. This is revised from time to time due to changing requirements of transportation needs.

With the help afforded by the CCC in the maintenance of truck trails and trails it has been possible to relieve the Forest Road Development fund



to an extent that it was possible to proceed with a limited amount of construction from the Forest Road Development fund. Gradually, year by year, the CCC work has been curtailed, both through the reduction in number of camps and in the funds available per camp. This has meant that the Forest Road Development fund has had to assume more and more of the burden of maintenance and consequently has had very little remaining for construction. With the decided curtailment in the number of CCC camps, the maintenance requirements for the fiscal year 1943 will leave none of the Forest Road Development fund for construction.

The problem and its significance: The gross National Forest area is approximately 10 percent of the entire area of the continental United States. The area is generally rough, rugged, mountainous, and remote. The forests contain 565 billion board feet of commercial saw timber besides many other timber, land, and water resources. Some 80,000,000 acres of the National Forests are utilized for grazing of over 12,000,000 sheep, goats, cattle, and horses each year. Developed and undeveloped water power amounts to 11 million horsepower. Many communities are dependent on the mineral resources in the forests. Recreation values are enormous, there having been over 38 million National Forest visits in the year 1940, of which number 15 million were summer home residents and guests, hotel and resort guests, campers, picnickers and winter sports participants. Nearly four million people live in or near the National Forests.

Providing the transportation system necessary for the proper and efficient administration, protection, development, and utilization of the National Forest land and resources is an obligation of the Federal Government.

Maintenance not only protects the large investment in roads and trails, but insures their continued future use, the value of which is incalculable.

There are within the National Forests deposits of many kinds of minerals now necessary for National Defense operations. Many of these are located in remote localities and frequently the roads for transporting the minerals from these localities to rail heads or similar points are inadequate in standard or are non-existent.

The use of development roads for protection from fire and sabotage, for power, mining, and other facilities is vital to National Defense and to the welfare of the nation.

The great curtailment and disbandment of over half the former number of CCC camps and the expected further reduction means that CCC enrollees cannot be used in fighting fires as largely as in the past and that greater numbers of men will have to be transported over much longer distances than heretofore. This will make necessary better and more frequent maintenance in order to provide for the necessary higher speeds and increased use of a greater mileage of these development truck trails.



General plan: On June 30, 1941, the planned Forest Development Road System consisted of the following miles of existing and proposed truck trails and trails:

	Truck Trails		Trails	
	<u>Miles</u>	<u>Percent</u>	<u>Miles</u>	<u>Percent</u>
Satisfactory standard	57,251	46	112,435	69
Unsatisfactory standard	36,695	30	33,460	20
Non-existing	<u>29,511</u>	<u>24</u>	<u>17,937</u>	<u>11</u>
Total	123,457	100	163,822	100

Examples of progress and current programs.

Of the 93,946 existing miles of truck trails in the system, only 78,000 miles will require actual maintenance work in the fiscal year 1943. The 15,946 miles not requiring maintenance consists of those roads which due to their location, standard of construction, type of material and the amount of use require maintenance work only every 2 or 3 years. Likewise, for the same reason there are 18,885 miles of trails which will not require maintenance during the fiscal year 1943.

No progress is anticipated toward the reconstruction and betterment required on the 36,695 miles of truck trails and the 33,460 miles of trails which are now existing but of inadequate standard to meet the needs. Nor is construction work contemplated on the 29,511 miles of truck trails and 17,937 miles of trails now non-existent but which are considered necessary for the National Forest administration, protection, utilization, and development.

EMERGENCY FUNDS

Project	Allotment, 1941	Estimated allotment, 1942
<u>Emergency Relief, Agriculture, Forest Service</u> (Transfer from W.P.A.) Forest Roads and Trails:		
Fire preparedness .....	\$300,000	\$400,000





BUREAU OF AGRICULTURAL CHEMISTRY AND ENGINEERING

(a) GENERAL ADMINISTRATIVE EXPENSES

Appropriation Act, 1942, plus \$1,000 supplemental for within-grade promo- tions .....	\$106,200
Budget estimate, 1943 .....	<u>106,044</u>
Change from 1942:	
Net reduction in working fund .....	- 1,200
Additional for administrative promotions .	+ <u>1,044</u>
Net decrease .....	<u>- 156</u>

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. General administration and business service .....	\$102,743	\$105,200	\$104,000	-\$1,200 (1)
2. Net cost of within-grade promotions .....	- -	1,000	2,044	+ 1,044
Unobligated balance .....	2,457	- -	- -	- -
Total .....	105,200	106,200	106,044	- 156

INCREASES OR DECREASES

(1) A decrease of \$1,200 under this item due to reductions in the estimates for temporary employees and equipment of \$700 and \$500, respectively.

WORK UNDER THIS APPROPRIATION

This appropriation provides for administrative supervision and direction of the work of the bureau, to carry on the business activities necessary for the proper functioning of the organization as a whole, including personnel, budget, bookkeeping, auditing, purchase and property, editorial and information, files, library, and miscellaneous services and records.



## (b) AGRICULTURAL CHEMICAL INVESTIGATIONS

Appropriation Act, 1942, plus \$2,878 supplemental for within-grade promotions .....	\$345,542
Second Supplemental National Defense Appropriation Act, 1942 .....	+ 20,000
Total available, 1942 .....	365,542
Budget estimate, 1943 .....	349,251
Change from 1942:	
Net decrease in working funds .....	- 20,000
Additional for Administrative promotions .....	+ 3,709
Net decrease .....	- 16,291

## PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Cereals, fruits, vegetables, and other agricultural products .....	\$139,549	\$124,580	\$124,580	
2. Sugars, sirups, and oils investigations .....	118,835	99,180	99,180	
3. Protein and nutrition investigations .....	27,886	27,960	27,960	
4. Fundamental investigations in chemistry, microbiology, and pharmacology relating to the composition technological utilization of agricultural products for food and feed ...	63,879	64,835	64,835	
5. Chemical weed eradication investigations .....	9,595	11,000	11,000	
6. Enzyme action in agricultural products .....	14,591	15,109	15,109	
7. Special soybean investigations .....	- -	20,000	- -	-\$20,000 (1)
8. Net cost of within-grade promotions .....	- -	2,878	6,587	+ 3,709
Unobligated balance .....	5,371	- -	- -	
Total .....	379,606	365,542	349,251	- 16,291

## INCREASES AND DECREASES

(1) A decrease of \$20,000 under this item due to the completion of Pilot Plant Investigations on Soybean Meal and Oil, for which \$20,000 was appropriated in the Second Supplemental National Defense Appropriation Act for the fiscal year 1942.



## WORK UNDER THIS APPROPRIATION

Objective: To devise means of reducing deterioration and spoilage of agricultural commodities between harvesting and processing, during storage, and after processing, and to find means of preventing deterioration of foods and feeds which must be stored under emergency and war conditions; to reduce handling and processing costs; to determine the composition and value of food crops and thus to assist in obtaining a suitable balance in farm production programs; to assist by chemical and technological means in developing "deficiency" crops (e.g., tung nuts for tung oil production) for supplying products for which existing supplies are inadequate; to investigate, and assist in controlling atmospheric pollution which causes injury to crops; to develop means of weed eradication by use of chemicals. Emphasis is placed on problems of particular importance in the present national situation, including Lease-Lend shipments of foods and of food supplies for United States military forces.

The problem and its significance: The present national situation has made it desirable to shift emphasis in this work program to phases which are of greatest importance under existing changed conditions. In accordance with instructions from the President (Budget Bureau Circular 330), this has been done, but without changing the general objective of the program. The importance of food in winning the war is generally recognized. The existing situation requires the solution of problems of processing, packaging, transportation and storage of food products which are radically different in many respects from those prevailing under ordinary conditions.

Thus, the shortage of refrigeration facilities on boats carrying food to Great Britain under Lease-Lend shipment has necessitated development of methods of preservation not ordinarily employed. Increased need has developed for dehydrated foods, both for military use and for Lease-Lend shipment, with emphasis on better retention of color, flavor and vitamins and (for military use) reduction in time required for rehydrating for cooking. Dehydration of foods conserves tin, reduces shipping weight, and prevents certain forms of spoilage. Necessity for building up reserves of food supplies in certain areas (including Great Britain) emphasizes the importance of keeping-quality and of precautions for minimizing deterioration in storage after processing and packing. Large Government purchases of food necessitates chemical, bacteriological and technological consideration of many problems arising in connection with processing, packaging and keeping-quality to meet new conditions and situations. The great increase in Army camps, especially in the South, has intensified the already existing need for more and cheaper winter feed for dairy cattle in that area. Shortage in some products is necessitating development of substitutes.

Assistance along the lines mentioned is being rendered under this work program. Solution of many of these problems will have peace time benefits. Thus, the Lease-Lend shipment of food products of satisfactory quality may be expected to pave the way for new and expanded export markets. Solution of the problem (intensified by war conditions) of more and cheaper winter feed in the South will have permanent results in better nutrition, and greater crop diversification in that region.





General plan: In general, basic work is conducted in Washington and applications are made at 12 field laboratories located in areas where production of the crops involved is greatest. The entire appropriation is being applied to work of the character indicated. Cooperation is maintained with the Army, Navy, National Research Council for Defense, Surplus Marketing Administration, other Bureaus of the Department, and State Agricultural Experiment Stations.

Examples of progress and current programs:

1. Cereals, fruits, vegetables, and other agricultural products:

Methods have been developed for vitamin enrichment of food products with wheat germ, peanut flour and soybean flour; work is being conducted on production of soybean-milk powder for shipment to Great Britain. A method is being developed for compression of flour, thereby reducing by one-third the volume in overseas shipment and transportation for military use. Because of lack of canning plants for processing peaches and other fruits in certain areas (e.g., North Carolina and South Carolina), a new method is being developed for preservation in bulk by cucumber pickling plants for further processing later. Increased demand for milk for army camps has intensified the need for more and cheaper winter feed in certain areas (particularly the South); a method of siloing cull sweetpotatoes and sweetpotato vines is being developed for this purpose. Since it is possible to produce five to six times as much carbohydrates per acre in the form of sweetpotatoes as in the form of corn in the South and the feeding value is practically the same, a cheap farm-scale method is being developed for drying sweetpotatoes for use as winter livestock feed in that area; commercial development is under way.

Investigation is being conducted on use of harmless chemical preservatives and development of suitable methods of producing and packing citrus (orange and grapefruit) and non-citrus (peaches, strawberries, etc.) marmalade stock for Lease-Lend shipment for supplying the "jam ration" of the British Food Ministry. Shortage of refrigeration during overseas shipment and in Great Britain necessitates special methods of processing and packing. Technological supervision will be given when commercial production is undertaken. Research is being conducted to improve quality, particularly stability during shipment and storage, of concentrated citrus juices (orange, lemon, lime) for Lease-Lend shipment; assistance regarding purchase specifications and examination of samples from shipments is being rendered.

2. Sugars, sirups, and oils investigations:

Because of shortage of hard waxes for production of a great variety of articles (surface-coating materials, plastics, use by the Navy, etc.), some of which are of strategic importance, a process has been developed for recovery (as a by-product of the sugar industry) of surface wax present on sugar cane, thus opening up a large, potential supply; commercial production is being undertaken. There is recovered from this wax a fraction similar to Japan wax (used on cartridge shells, etc.); since importation of Japan wax has ceased, effort is being made to develop this wax fraction commercially. There is also recovered with this wax a chemical compound (concentrated in the wax from a potential supply of millions of tons of sugar cane processed for sugar) of a type used for conversion into vitamin D. Endeavor is



being made to convert this particular compound into vitamin D. If successful, this would make possible production on a vast scale of vitamin D, important nutritionally for war and post-war periods. There is also a possibility of obtaining supplies of vitamin A from the same source.

It has been found that aconitic acid (an excellent plasticizing agent for production of plastics and heretofore available only in limited quantity at high price) can be recovered in large total quantity at low cost as a by-product of the cane sugar industry. There is urgent need for increased production of plastic products to conserve strategic metals in manufacturing a great variety of articles, but because of war conditions production is handicapped by shortage of plasticizing agents. Recovery of aconitic acid from sugar cane is being developed to supply this need. As a result of a clue obtained in work on sorghum sirup, a commercially practicable process has been developed where by as high percentage extraction of sugar can be obtained from sorghum as from sugar cane; it is expected that this process will make possible a lower cost for sugar and will permit extension of the producing area in continental United States. It will make possible rapid increase in continental sugar production in case of shortage.

Because of shortage of drying oils (of critical importance for paints and surface protection of both civil and military structures and equipment) a method of solvent extraction of tung oil, whereby recovery from tung nuts is increased to practically 100 percent, has been developed; commercial application is being undertaken.

### 3. Protein and nutrition investigations:

Serious shortage of protein foods and feeds in Great Britain is an important consideration in Lease-Lend shipments. Dietary deficiency of protein causes retarded growth, lowered physical and mental efficiency, and increased susceptibility to infectious diseases. The question of adequate protein in the diet involves both quantity and quality. Investigation is being made of impairment of value of proteins in foods by heating and by other treatments involved in processing, and particularly by storage after processing. The latter is especially important in food "dumps" for establishing reserve food supplies in Great Britain.

It has been found that storage of wheat, corn and soybeans may cause pronounced changes in the chemical properties and nutritive value of their proteins. Twelve months' storage of ground corn caused a loss of one third of the nutritive value of its protein. Following a recommendation of the National Nutrition Conference for Defense, work is being conducted on effect of storage of wheat and corn upon their protein and vitamin values and on means of preventing deterioration. Study is being made of the proper manner of heating and range of temperature required to produce soybean meal having the maximum protein nutritional value.

Meat, eggs, and milk, excellent but costly protein foods, which are largely depended upon in normal times, but which may be insufficiently available for all purposes under war conditions, may have to be replaced in part by





substitutes that can be shipped without spoilage and with minimum space requirements. The nutritive value of such substitutes must be known. Investigation is, therefore, being made of the composition, digestibility and nutritive value of proteins of various cereals and seed products (cottonseed meal, etc.).

4. Basic investigations in the chemistry, microbiology, and pharmacology of agricultural products:

Investigation is being conducted on means of improving uniformity, packaging, and stability in storage of liquid and dried eggs for Lease-Lend shipments and storage in food "dumps". Because of shortage of refrigeration facilities in overseas shipment and subsequent storage, means of using harmless chemical preservatives for liquid eggs have been developed. Chemical and bacteriological assistance in formulation of purchase specifications and systematic examination of samples from shipments is being rendered. Work is being conducted on improvement in keeping quality of Lease-Lend shipments of canned poultry meat which is to be packed for shipment to hospitals in Great Britain and Egypt. Systematic bacteriological examination of samples from shipments will be made.

In collaboration with the War and Navy Departments work is being conducted on application of a method of plant material preservation previously developed by the Bureau to outdoor use for increasing the life of detached foliage used in military camouflage. It is necessary to develop suitable weather-proofing and preservative treatments which are not detectable by aerial photography.

5. Chemical weed eradication investigations:

Increasing shortage of farm labor emphasizes the desirability of chemical methods of weed eradication. Work is being conducted on use of gases for this purpose. In fumigations with sulphur dioxide gas wild mustard and English plantain were found to be unusually susceptible to damage by exposure to sulphur dioxide in low concentrations, the portions above ground being easily destroyed by a single fumigation.

As an application of chemical weed eradication work, investigation is being conducted in cooperation with the War and Navy Departments, on use of portable, flexible, chemically-treated, mats of green vegetation for military camouflage. These mats are being developed so as to withstand variable weather conditions. In anti-camouflage studies a method is being developed which, according to present indications, will make it possible, by aerial reconnaissance, to detect certain forms of camouflage.

6. Enzyme actions in agricultural products:

Ripening and spoilage of agricultural commodities are caused by action of ferments (enzymes) in the natural products. These changes can be retarded or modified by treatments that affect the ferment action. Study of enzyme action in wheat has led to development of a method (treatment with traces of ethylene gas) whereby the ripening and curing of moist, freshly harvested wheat is greatly accelerated (application made for public patent). In a large test at





Manhattan, Kansas, the treated wheat made flour of substantially higher quality than that from untreated wheat and the grain kept much better in storage.

Because of necessity of storing reserve grain, this new treatment is being perfected with cooperation of the Kansas Agricultural Experiment Station. The need for this development is shown by current estimates that, when harvested, probably ten percent of domestic wheat is unfit for storage without expensive pre-drying. Because the scientific principles involved appear to be the same with wheat and corn, similar tests are under way on storage of freshly harvested, shelled corn.

Study of enzyme action in vanilla beans has resulted in a new process of curing them (application made for public patent). Because it is faster the process helps to relieve the present scarcity of vanilla; because it makes a superior product, the tropical dependencies of the United States (especially Puerto Rico) may enlarge a now small but profitable agriculture.

#### 7. Soybean investigations:

The Office of Agricultural Defense Relations has stated that there is a shortage of raw materials for manufacture of plastics and a shortage of milk casein for production of adhesives, and that there is impending a shortage of drying oils, caused by inability to obtain normal supplies of imported linseed, tung, and perilla oils. Casein supplies are being reduced by increasing assignment to food use.

Soybean protein is equivalent to casein for adhesives, such as for paper coating, ply-wood, etc., for which purposes most of the casein supply is commonly used. Soybean protein and extracted soybean meal impart desirable properties to plastics of certain types and increase the yield. Investigation indicates that it is possible to separate from soybean oil a fraction (about 40% of the whole) which has drying properties equal or superior to those of linseed oil.

The Second Supplemental National Defense Appropriation Bill, approved October 28, 1941, contains an item of \$12,000 for intensifying research on uses of soybean meal and protein, and an item of \$8,000 for intensifying research on uses of soybean oil along the lines indicated. Work has been undertaken under this appropriation to extend previous investigations to a pilot plant scale. Work is being conducted on the chemical and physical properties of soybean meal and protein in relation to use in plastic materials, adhesives, sizes, and coating finishes and on fractionation of soybean oil into drying and non-drying portions



(c) INDUSTRIAL UTILIZATION OF FARM PRODUCTS AND BYPRODUCTS

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Waste investigations .....	19,238	- -	- -	
2. Harvesting, collecting, pre- servation and transportation of agricultural residues .....	2,378	- -	- -	
Estimated savings and unobligated balance .....	934	- -	- -	
Total .....	22,550	- -	- -	

WORK UNDER THIS APPROPRIATION

In accordance with the suggestion set forth in the House Committee Report on the 1941 Appropriation Act, the work under this appropriation has been transferred to the four regional research laboratories.

(d) AGRICULTURAL ENGINEERING INVESTIGATIONS

Appropriation Act, 1942, plus \$4,450  
    supplemental for within-grade  
    promotions ..... \$318,919  
Budget estimate, 1943 ..... 343,733  
Change from 1942:  
    Net increase in working funds ..... + 20,000  
    Additional for administrative  
    promotions ..... + 4,814  
    Net increase ..... + 24,814

PROJECT STATEMENT

Project	1941	1942 (estimated)	1943 (estimated)	Increase
1. Advice and assistance .....	\$22,748	\$25,900	\$25,900	
2. Farm mechanical equipment .....	92,902	96,300	96,300	
3. Farm structures and related investigations .....	78,387	78,900	78,900	
4. Mechanical processing of farm products .....	69,461	83,369	103,369	+ \$20,000(1)
5. Rural electrification investi- gations .....	29,532	30,000	30,000	
6. Net cost of within-grade promotions .....	- -	4,450	9,264	+ 4,814
Unobligated balance .....	11,439	- -	- -	
Total .....	304,469	318,919	343,733	+ 24,814



## INCREASES

(1) An increase of \$20,000 (non-recurring) to provide water under pressure and to provide water storage and distribution system at the U. S. Cotton Ginning Laboratory, Stoneville, Mississippi.

Objective: To safeguard government-owned property valued at over \$250,000 and to protect it against damage or loss by fire by providing adequate fire protection for the U. S. Cotton Ginning Laboratory.

The problem: The Government has an investment in the U. S. Cotton Ginning Laboratory of more than \$250,000 and valuable records accumulated over many years. These consist of buildings, experimental ginning machinery and experimental cottons which during certain periods of the year must be stored in the government cotton house. The present fire protection system is operated jointly by the Mississippi Delta Branch Experiment Station and the Laboratory. It draws its water from Deer Creek, and it is inadequate and uncertain because an adequate water supply is not available when flow stops in Deer Creek. The water from Deer Creek is heavily polluted by sewage and if utilized for fire fighting purposes constitutes a menace to health and to property. The existing 6" mains are too small to provide an adequate water supply if a serious fire occurs. To secure dependable protection there is needed at least 100,000 gallons of water stored in an elevated tank, a pump for taking the water from government-owned artesian well and putting it in the tank, together with an adequate distribution system of 8" pipe and necessary hydrants.

Significance: The proposed facilities when installed will furnish dependable and adequate water supply for fire protection to the government property and to the adjacent Delta Branch Experiment Station. During the past five years the State of Mississippi has suffered two serious fire losses estimated at \$75,000 and \$50,000 respectively together with several minor losses. In the Laboratory where many experimental tests are conducted and experimental equipment is required in an effort to improve the ginning of farmers' cotton, the number of fires is not predictable, but minor ones have occurred on an average of about four times a year due to the same causes as fires encountered in commercial gins. An additional hazard is imposed on the Laboratory during the cotton ginning season by the necessary collection of a large variety of experimental cottons which are concentrated at the Laboratory site pending their ginning and return to Federal and State experiment stations or cooperative parties from which they were obtained. In this storage of cotton, danger of spontaneous combustion is always present. As a consequence, there is usually on hand a quantity of cotton ranging in value from \$5,000 to \$20,000 which must be safeguarded. This cannot be properly accomplished by use of the present fire protection system, because first, the supply is inadequate, especially in the fall of the year when the amount of cotton on hand is greatest; second, because the sewage-laden muddy water from Deer Creek would ruin both seed cotton and cotton bales even if the fire were extinguished before the materials were destroyed; and third, because of possible interruption of electric power in case of a serious fire.

Plan of work: An elevated storage tank will be built, and necessary pump, mains and hydrants installed. A pure water main from the well, by means of a small float control automatic motor pump outfit, will maintain a fixed water level in the elevated storage tank.





### CHANGE IN LANGUAGE

The estimates include a proposed change in the language of this item as follows (new language underscored):

" \* \* \* for giving expert advice and assistance in agricultural and chemical engineering; for collating, reporting, and illustrating the results of investigations, and preparing, publishing, and distributing bulletins, plans, and reports, \$340,469, of which amount not to exceed \$20,000 shall be available for the construction of a water tower fire protection system at the U. S. Cotton Ginning Laboratory, Stoneville, Mississippi."

This change provides the necessary authorization for the construction of a water tower fire protection system at the U. S. Cotton Ginning Laboratory, Stoneville, Mississippi, for which \$20,000 is included in the 1943 estimates.

### WORK UNDER THIS APPROPRIATION

Objective: To determine the basic principles governing the efficient performance of farm machinery and equipment; improve existing and develop new types of farm machinery adaptable to the physical characteristics of farm land; to design and study requirements of better farmhouses and also buildings for processing and storing farm products and housing animals; to study the engineering problems of cotton ginning and fiber flax processing; to extend the uses of rural electrification; to give advice and assistance in agricultural and chemical engineering; to prepare, publish and distribute bulletins, building plans and other farm engineering information.

The problem and its significance: The existing national situation emphasizes the need for increased agricultural engineering aid to farmers in solving their primary problems such as technical guidance in the utilization of farm machinery and power; adequate, efficient and economical houses for farmers, for animal shelters and for the storage of agricultural crops; problems involved in cotton ginning to produce a better product at less cost; the harvesting and processing of fiber flax so as to stimulate domestic production by reduction of costs; income-producing uses for electricity on the farm; and the dissemination of information on these projects.

Farmers are faced with a national program calling for increased farm production and at the same time, because of defense needs, they are unable to replace farm machinery to carry out the program. One solution of the problem is to make the most effective use of existing machinery and power and this requires determination of the basic factors governing the most efficient performance of the many types of farm equipment for the production of crops.

A farm housing survey showed that more than 700,000 farm houses in the United States had deteriorated to the point where they should be replaced by new buildings. Many barns, storages, and animal shelters have depreciated until they are now of little service and, in addition, the expansion in livestock and the ever-normal granary is creating new needs for more buildings. There is a large accumulated volume of buildings, repairs and improved equipment to be supplied and the withdrawal for defense purposes of commonly used building



material necessitates the finding and use of substitutes for building and remodeling. The cost of repairing houses not to be replaced was estimated at approximately \$3,250,000,000. As these improvements require large aggregate expenditures by farmers, it is important that reliable information about them be made available.

The cotton ginning research program is directed toward increasing the capacity and better performance of existing cotton ginning equipment in order to increase quality ginning at lower costs to the grower. Packaging and pressing of the ginned lint into bales of uniform weight and quality are urgent needs of the cotton industry today. Processes must be developed for obtaining uniformity, both as to quality and even distribution in all parts of the bale.

Investigations on fiber flax are concerned with the improvement of methods and machinery used in producing high quality fiber at lower costs of production. A reduction in the cost of harvesting and processing of fiber flax will stimulate an increase in the domestic production of a non-surplus crop to the point where American grown flax can compete in quality and quantity with that of other countries.

The widespread growth of rural electrification has taken electricity to all classes of farms where it is a factor in improving farm living conditions but contributes little toward its own cost. The problems needing solution are - what income-producing uses can be developed on the farm that will support the entire farm and home electrification program and perhaps net an income in addition; how can electricity aid in an expanding food production program; how can it substitute for labor now occupied with defense activities?

General plan: In general, the basic work as well as the practical application thereof is carried out at 20 field locations in areas where farm crops and machinery are of the greatest importance. The information thus acquired is edited and placed in final form in the Washington offices for dissemination to the public. Cooperation is maintained with State colleges, agricultural experiment stations, and many bureaus of the Department.

Examples of progress and current programs:

Advice and assistance: Approximately 425 scientific articles were edited for presentation at meetings and for publication in scientific, technical and trade journals; approximately 60 mimeographed circulars, 30 Departmental bulletins, and numerous addresses were prepared. Drawings and illustrative material based on the research work of the bureau: charts, maps, plans of machines, patent drawings and designs were prepared.

Farm mechanical equipment: Tests have shown that much of our fertilizer and insecticide distributing equipment is both inaccurate and wasteful of the materials dispensed. Intensive research has already shown that erratic delivery of these chemicals is due in part to lack of uniformity of the materials themselves and in part to faulty designs of machine parts. In the face of threatened shortages of chemicals, present work is directed toward their most efficient use.





The design of tillage machinery for cotton and some other crops has been improved and several items of equipment have been developed especially for the one-mule cotton farmer, including a terracer, peanut planter, small plow attachment, and a combination corn, cotton and vetch planter with fertilizer attachment.

Sugar needs will doubtless increase with the duration of the emergency, making necessary more complete mechanization of sugar beet production. The new technique in planting sugar beet seed gives promise of reducing planting costs by saving seed and cutting the labor needed in thinning. Three experimental sugar beet harvesters have given encouraging results in field tests.

Cultivating corn planted on the contour for soil and moisture conservation has been successfully accomplished, and mechanical corn picker efficiencies have been increased by replacing the standard rolls with special experimental ones. Sub-surface cultivation, without disturbing crop residues on the soil, to conserve moisture and prevent soil erosion indicates considerable promise and is being investigated at several of the stations.

Farm structures and related investigations: Studies in Wisconsin for increasing winter comfort in farmhouses and in Georgia for summer comfort, show that 45 percent of fuel can be conserved by use of insulation and protection of the houses from direct sunshine. Improved conditions in livestock structures such as better lighting in dairy barns, more positive sanitation and protection of small pigs to reduce high mortality in hog houses, and better control of ventilation and light in poultry houses are needed to further the program for increased production of livestock.

A metal grain bin has been designed for farm storages which the Commodity Credit Corporation purchased for \$1,250,000 less than the cost of bins they previously purchased. The findings of our research on corn and wheat at Ames, Iowa, and other points are used as a basis for recommending safe storage practices in connection with the "ever-normal granary" project.

Grass silage was frequently stored in temporary silos of fencing and kraft paper. As these are now emergency materials, more use will have to be made of permanent silos which must be strengthened because grass silage has greater pressure than corn silage nullifying the full use of existing structures on account of weakness.

Irish potato storage houses have been developed from research findings and in the Maine area alone, houses built like these have reduced shrinkage losses, permitting the marketing of 8,288 barrels of potatoes that would have been lost. This means \$18,900 more per year to the farmers who have built these houses; also the depreciation rate on the new storages is about 5 percent as compared with 10 percent on the old type. Apple storage structures throughout the Wenatchee, Washington, apple area indicate that more efficient methods of operation and more adaptable equipment are needed so that full use can be made at this time of cold storage facilities.





It is essential at this time to conserve fuel oil and our investigations show how 12 percent of the oil normally burned can be saved. Plans are under way to introduce to the oil-burning industry a simple test that should prove effective in saving 200 gallons of oil by each of the 2,000,000 oil burners in use east of the Allegheny Mountains. A very efficient and smokeless orchard heater has been invented that will practically eliminate soot which formerly has prevented successful raising of citrus fruits in California. A thermostatically controlled wood burning heater is being studied with the purpose of facilitating the use of wood if the distribution system of other solid fuels is affected by transportation of defense materials.

At present studies are in progress in Colorado to improve methods of shipping potatoes so that they will not deteriorate before they reach their destination.

Mechanical processing of farm products: Cotton Ginning Investigations - Two thousand or more research tests on saw and roller ginning, cleaning, extracting, conditioning and pressing are being conducted this season. The findings are passed on to farmers, ginners and the cotton industry as rapidly as they can be fully verified. More cotton ginning capacity on existing gin stands through higher saw speeds is being obtained by numerous farm and public gins through information supplied by the laboratory staff. It is estimated that over a hundred older gins have thus increased their capacities this season at low expenditures. Roller ginning improvements and developments from the laboratory are being tried out at southeastern Sea Island and southwestern American-Egyptian roller ginneries. These improvements in roller ginning are producing better grades and greater capacities per stand. Pure seed preservation work at the Cotton Ginning Laboratory is developing methods and equipment for better seed handling with greater economy. Research in cleaning cotton fiber between the ginning and baling stages is being carried on with cotton mill and other forms of cleaning equipment in an endeavor to obtain bales of fiber freer of waste or foreign matter than now available.

Fiber flax investigations - The Oregon flax mills have adopted several pieces of machinery developed by the Bureau which have been constructed by local machinery shops. Flax pullers, deseeders, elevating equipment and tow shakers introduced or developed by the Bureau are now in general use. Plans for flax mills which make possible more efficient plant management have been worked out and are being used in the construction of new mills.

Rural electrification investigations: Progress in the solution of problems is indicated by results as follows:

Cooling eggs to a temperature below 70° Fahrenheit within two or three hours after they are laid and holding them in an atmosphere with relative humidity of 75 to 85% resulted in eggs grading 51.9% extras, while those held in room conditions graded 17.6% extras. Different methods of cooling resulted in different net profits to the producer, but eggs cooled in an evaporator cooler and in a domestic refrigerator showed savings of 65 to 37 cents per case, respectively.

Studies are being completed on the use of a small amount of heat in the pen for early spring farrowed pigs resulted in saving around 10% more pigs alive.



at weaning time than were saved in unheated pens. Pigs for which the so-called brooders were provided developed more rapidly than those in cold pens.

Radiations in either the ultra-violet or infra-red part of the energy spectrum are effective in killing bacteria in dairy utensils. Ultra-violet radiations destroyed 99.6% of living bacteria in two minutes while live steam destroyed 99.9% in one minute of treatment of 10-gallon milk cans.

One labor-saving device has been developed during the past year: A cross-cut saw suitable for use on the farmstead wood pile, powered by a 1/4 horsepower electric motor. The device may be built at home at relatively low cost.

To meet the demands of the expanded agricultural program the following problems involving electrification are being studied: Egg cooling on the farm, the needs of farm refrigeration including the frozen storage unit; the brooding of pigs and chicks; milk cooling units; the use of electric energy in the drying of fruits and vegetables for farm use; the warming of water for stock. The study of farm operations and processes, and possible community enterprises is being continued.

#### (e) NAVAL STORES INVESTIGATIONS

Appropriation Act, 1942, plus \$1,205  
 supplemental for within-grade  
 promotions ..... \$116,605  
 Budget estimate, 1943 ..... 112,456  
 Change from 1942:  
 Additional for administrative  
 promotions ..... + 1,351

#### PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Investigation of naval stores production, processes and equip- ment .....	\$38,827	\$52,906	\$48,731	-\$4,175 (1)
2. Investigation of the composition, properties, components and deri- vatives of naval stores .....	25,531	31,356	31,856	- -
3. Investigation of uses, handling and transportation of naval stores .....	22,624	27,638	31,213	+4,175 (1)
4. Construction and improvements at naval stores station .....	3,892	3,000	3,000	- - (2)
5. Net cost of within-grade promotions .....	- -	1,205	3,056	+1,351
Unobligated balance .....	2,526	- -	- -	- -
Total .....	93,400	116,605	118,456	+1,351



### INCREASES AND DECREASES

(1) An adjustment of \$4,175 between work projects one and three to enable the placing of needed emphasis on the "Uses and handling, and transportation" phases of the work where new problems have been created by the present war effort.

(2) While the amount allocated to project four is not increased over that provided in 1942, the following changes are included:

(a) An increase of \$3,000 (non-recurring) is requested to provide funds for an improved fire-protection system for the Naval Stores Station at Olustee, Florida.

Objective: To provide additional pumps and auxiliary equipment for an adequate fire-fighting system.

The problem and its significance: When the Naval Stores Station, Olustee, Florida was established in 1932 with funds appropriated for that purpose, the money available was not sufficient to provide adequate fire-fighting equipment. The Station is slightly over a mile from Olustee which has no fire protection system, and Lake City, Florida, which is the nearest city with a volunteer fire protection system is 12 miles distant. The system at the Naval Stores Station at present consists of 6 hose houses with regulation fire hose supplied with 1-1/2 inch water lines. The source of the water supply is a 20,000 gallon tank mounted on a 40 foot tower, which gives a pressure of 25 pounds. The inflammable materials used in the research work and the frame houses at the Station present a serious fire hazard to property valued at \$150,000. Inspection by the Safety Engineer of the Bureau has resulted in the recommendation that pump and auxiliary equipment be installed to give adequate water pressure for fire fighting which is now lacking.

Plan of work: It is proposed to install three additional hose houses, the necessary piping, and an electric pumping system to provide adequate pressure to combat fires. Installation will be by force labor. Funds will be used to purchase materials and equipment.

(b) A decrease of \$3,000 due to the dropping of a non-recurring item provided for in 1942 for making improvements in roads and drainage ditches at the naval stores station, Olustee, Florida.

### WORK UNDER THIS APPROPRIATION

Objective: To increase the usefulness and fields of use of naval stores, thus improving the economic status of a growing number of low-income farmers in the South; to develop products from naval stores with particular emphasis on vital products; specifically to conduct research on improved production methods to meet increased emergency needs for naval stores and on development of new and diversified products now needed for specific emergency purposes and useful later to build a more satisfactory post-war economy than has prevailed heretofore.







The problem and its significance: Of special significance at the present time are problems dealing with the utilization of naval stores and its derivatives to meet such specific requirements as: the development of flame thrower fuels and incendiaries, smoke screen material, products for rotproofing sandbags and other fabrics, satisfactory resins to be used in curing of concrete for emplacements, camouflage materials, etc., and for developing an adequate supply of derivatives used in the preparation of high octane fuel and of synthetic camphor essential for smokeless powder.

Inadequate imports of surface coating raw materials and increasing demands for these products call for development of supplements and replacements. Resort to resins and plastics to provide substitutes and supplements for strategic materials is increasing. It is recognized that no single resin or plastic can possess the wide variety of properties needed to meet the varied needs of industry. In fact, an increasingly large number of resins and plastics will be required to supplement synthetic resins for which there is already developing a shortage of raw materials and to supplement curtailed supplies of fossil gums, shellac and other natural resins now imported.

The problem of an adequate supply of drying oils and oils from soap stocks is becoming serious. To relieve the drying oil situation resort must be made, more and more, to semi-drying oils. It is possible to produce derivatives from turpentine which will hasten the drying of these semi-drying oils and thereby permit their more widespread use. It is possible to replace, in part, imported soap materials by resin.

In view of the increasing need for synthetic rubber and since no single synthetic rubber is to be expected to fulfill the varied requirements of industry, there is an increasing need for "intermediates" or chemicals for making synthetic rubber. Turpentine derivatives have been obtained which, it is believed, can serve not only for the production of synthetic rubber, but also in conjunction with other intermediates to impart to synthetic rubbers specifically desired properties.

Pine oleoresin, the source of raw materials for drying oil promoters, for synthetic rubber, for protective coatings, for soap, for chemicals such as cymene, camphor, and other chemicals vital for war and defense needs, is an abundantly available, annually reproducible crop, with potentialities for increased production.

To meet the increasing demand for naval stores for defense purposes will require, in view of scarcity of labor and the difficulty of obtaining equipment, the development of improved processing and suitable equipment from available structural materials.

Increasing shortages in metal containers for naval stores products necessitates study of methods of packing, storing and handling of rosin and turpentine.

General plan: Research and technical work under this appropriation is being conducted in the field and at the Washington laboratories as follows:



Studies on production, processes and equipment are carried on at the Naval Stores Station, Olustee, Florida; studies on composition, properties, components derivatives of naval stores, and on uses, handling and transportation of naval stores are carried on in the laboratories at Washington. Results obtained from studies on composition and derivatives, constitute a basis for studies on new uses and methods of handling. In some instances results from studies of composition and new uses are translated into larger-than-laboratory scale work at the Naval Stores Station. Some problems under study are carried on at Washington and vicinity, including Washington Recreational Camp, Fort Belvoir and Edgewood Arsenal, in close cooperation with the Quartermasters Corps, Corps of Engineers, Chemical Warfare Service, and other national defense agencies concerned.

Examples of progress and current programs: The following examples of recent accomplishments under this appropriation are cited by major projects to show progress on one or more aspects of the broader problems confronted. Other aspects of these problems are cited as indicating next logical steps to be taken in the research program.

Investigation of uses, handling and transportation of naval stores: In cooperation with the Chemical Warfare Service, a study made of the properties of pine gum rosin and turpentine indicates that these materials may be valuable for use in flame thrower fuels, producing gray smoke screens, and as incendiary materials. Preliminary findings on rotproofing sandbags and camouflage fabrics indicate continuance on developing preservatives in cooperation with the Corps of Engineers. A study of these factors in the esterification of rosins forms the basis for more efficient commercial methods of production of resin esters to supplement supplies of synthetic resins. Laboratory tests made indicate that an inexpensive paint applied to black iron rosin drums retards rusting during storage. Combined studies in cooperation with the Quartermaster Corps in treatment of fireproofing and treatment for purposes of reflecting heat from tents in summer and for retaining heat in colder months are being conducted. Essential statistics are gathered to serve as a basis for the production goal and for assuring an adequate supply of naval stores for domestic use and Lend-Lease needs, and to furnish government agencies such as Surplus Commodity Corporation Corps and Office of Production Management statistical information on production, supply and consumption of Naval Stores.

Investigation of the composition, properties, components and derivatives of naval stores: Data obtained on the composition of sulphate wood turpentine and comparative data developed on gum turpentine and steam-distilled wood turpentine enabled producers to evaluate these products as raw materials for chemicals, particularly as sources for a- and b- pinene (major constituents). Studies made on the thermal treatment of these two main components (the pinenes) of turpentine show that derivatives obtained by this treatment possess valuable properties for usefulness in the synthetic resin, plastics, drying oil, and synthetic rubber fields.

Information on the separation and identification of resin and resin acids, and improvements in equipment for gum fractionation made for the production of fractions and derivatives yielding "rosins" with special properties suitable for





specific industrial purposes and those arising from the present emergency.

Investigation of gum fractionation and isomerization of resin acids for the production of diverse derivatives such as terpene-type resins and plastics to augment the inadequate supply of synthetic resins and plastics; study methods of stabilization of rosin acids for the preparation of derivatives that may supplement and replace "fossil" gums, shellac, and other imported natural resins; study methods for the production of derivatives suitable for use drying oil promoters; methods for the production of derivatives suitable for use as raw materials for making, and for imparting special properties to synthetic rubbers; methods for the production of highly reactive derivatives from turpentine to make polymerized resins suitable for curing concrete; method for catalytic oxidation and dehydrogenation of turpentine components for the preparation of such essential chemicals as cymene derivatives for aviation fuel and synthetic camphor for use in making smokeless powder.

Investigation of naval stores production processes and equipment: Designs for turpentine fire still sheds, settings, and improved techniques of operation have been made available to producers. A gum cleaning process developed is now in commercial operation, and continuous processing, an advance over the present batch method, is being developed. A glass turpentine cup, resistant to fire and freezing, has been designed embodying the advantages of both clay and metal cups. A low cost combined separator and dehydrator (to remove water from turpentine) has been designed and is being rapidly adopted by producers. A jet condenser, more efficient than the present copper coil condenser, has been designed. This improved condenser automatically washes the turpentine, making it less corrosive to metal containers.

Some of the fields in which research and commercial adaptation investigations are being pursued are: substitution of suitable metals for stainless steel and aluminum in design of central plants needed to fulfill production goal; methods of gum storage permitting year-round operation of plants; studies of gum standards and grading techniques to assure equitable returns to gum farmers; introduction of more efficient operation to gum farmers by Naval Stores field agents to meet goals and conserve turpentine; develop and introduce efficient condensers and turpentine gum traps adapted to existing plants; preservative methods for wooden resin barrels and rustproofing black iron to replace galvanized drums.

#### SUPPLEMENTAL FUNDS

Projects	Allotments 1941	Estimated, allotments 1942	Estimated, allotments 1943
<u>Arbitration of Smelter Fumes Controversy, United States and Canada, (Transfer to Agriculture) Bureau of Agricultural Chemistry and Engineering). For smelter fumes investigations to determine damage to crops and forests in the State of Washington</u> .....	\$681	- -	- -
Estimated savings and unobligated balance .....	119	- -	- -
Total .....	1,000	- -	- -





SUPPLEMENTAL FUNDS - Continued

Projects	Allotments 1941	Estimated Allotments 1942	Estimated allotments 1943
<u>Special Research Fund, Department of Agriculture.</u> For special research projects in the fields of chemistry and engineering:			
Special research projects .....	\$137,727	\$105,410	\$93,410
Special research laboratories in major agricultural regions ....	\$137,727	\$105,410	\$93,410
Within grade promotions- net cost .	96,366	94,500	94,500
Estimated savings and unobligated balance .....	- -	1,854	- -
Total .....	3,133	- -	- -
	237,226	201,764	187,910
<u>Conservation and Use of Agricultural Land Resources (New Uses and Markets for Farm Commodities, Regional Laboratories).</u> For four regional research laboratories, to develop new uses and markets for farm commodities, authorized by Sec. 202 of the Agricultural Adjustment Act of 1938 ...	2,982,550	3,478,000	3,980,200
<u>Emergency dehydration investigations (Department of Agriculture, Bureau of Agricultural Chemistry and Engineering).</u> For the improvement of methods of production and distribution of dehydrated foods .....	- -	70,000	- -
<u>Working Fund, Agriculture, Chemistry and Engineering (Transfer from Commodity Credit Corporation Capital Fund)</u> For investigation of methods of properly storing and caring for grain on farms .....	- -	15,000	- -
<u>Working Fund, Chemistry and Engineering</u> Advance from "Navy Yard, Charleston, S. C." For the development of foliage preservation methods for use by the Army and Navy in connection with the procurement of materials .....	852	- -	- -
Estimated saving and unobligated balance .....	148	- -	- -
Total .....	1,000		



SUPPLEMENTAL FUNDS - Continued

Projects	Allotments 1941	Estimated, allotments 1942	Estimated, allotments 1943
<u>Working Fund, Agriculture, General</u> (Emergency Management). For subsistence, travel, and other expenses necessary to provide training for 4 agricultural chemists from the Republic of Argentina in the Regional Research Laboratories of the Bureau.	- -	\$8,800	\$2,400
<u>Working Fund, Agriculture, Chemistry and Engineering (Office for Emergency Management, War)</u> For the conduct of experiments on a commercial scale on the use of lint cotton in the manufacture of smokeless powder .....	\$4,750*	- -	- -
<u>Removal and reestablishment of Arlington Farm, Virginia, (Transfer to Agriculture) Bureau of Agricultural Chemistry and Engineering.</u> For the removal and reestablishment of functions and activities at Arlington Farm, including plans and specifications, erection of building, equipment, etc., at the Beltsville Research Center .....	266,000**	- -	- -
Total, Supplemental Funds (Direct allotments .....	3,498,526	3,773,564	4,170,510

\* Available until June 30, 1942.

\*\* Available until expended.

PASSENGER-CARRYING VEHICLES

The authorization for the purchase of passenger-carrying vehicles for the Bureau of Agricultural Chemistry and Engineering provides for a decrease in number of cars to be purchased from 4 in the fiscal year 1942 to 2 in the fiscal year 1943. The 2 cars to be purchased in the fiscal year 1943 will permit the replacement of this number of vehicles, at an estimated cost of \$1300. No new vehicles other than replacements are to be purchased in 1943.



The automobile is practically indispensable for the proper conduct of the bureau's work since a great many of the points visited are in remote areas where public transportation facilities are very limited and in many cases are not at all available. The bureau has many experimental projects located on privately-owned farms, and it is sometimes necessary that employees go from farm to farm in checking up on these projects. Public conveyances are not available for such trips, but an automobile makes it possible to visit a number of farms in a day. The purchase and operation of Government-owned cars has been found from experience to be more economical than either the hiring of commercial automobiles or the use of personally-owned cars of employees on a mileage basis. Records kept over a series of years indicate that the average per mile cost of a Government-owned car, figuring in the purchase price and all operating and maintenance expenses up to the time it is turned in as no longer serviceable and then deducting the exchange allowance, is less than three cents. On the other hand, the cost of hiring personally-owned vehicles averages about four cents per mile and for hiring commercial cars from ten to fifteen cents per mile.

Neither of the cars to be replaced is of a model more recent than 1937. These machines have been operated under practically all conditions of use, ranging from city streets to extremely rough country roads. The average mileage as of June 30, 1941, was approximately 54,000 miles and considerable more will be added before they are actually turned in. In the experience of the bureau, cars do not operate efficiently or economically beyond this mileage, and it appears to be distinctly in the best interests of the work to turn them in during the fiscal year 1943.





CONSERVATION AND USE OF AGRICULTURAL LAND RESOURCES  
DEPARTMENT OF AGRICULTURE

NEW USES AND MARKETS FOR FARM COMMODITIES  
(REGIONAL LABORATORIES)

Appropriation Act, 1942.....\$3,500,000 (a)  
Budget Estimate, 1943.....4,000,000 (a)  
Increase.....500,000

(a) Allotment pursuant to Sec. 202(a)-(e) A. A. Act of 1938 (52 Stat. 31-70) from "Conservation and Use of Agricultural Land Resources, Department of Agriculture", provided by Agricultural Appropriation Act.

PROJECT STATEMENT \*

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Northern regional research laboratory.....	\$713,622	\$835,750	\$960,750	+\$125,000 (1)
2. Southern regional research laboratory.....	694,598	835,750	960,750	+ 125,000 (1)
3. Eastern regional research laboratory.....	712,070	835,750	960,750	+ 125,000 (1)
4. Western regional research laboratory.....	654,246	835,750	960,750	+ 125,000 (1)
5. Central administration, planning and coordination..	100,532	148,000	150,200	+ 2,200 (2)
Estimated savings and unobligated balance.....	120,932	--	--	--
Total.....	2,996,000	3,491,000	3,993,200	+ 502,200
Transfers as shown in budget schedules.....	+ 4,000	+ 9,000	+ 6,800	- 2,200 (2)
Total, Allotment from "Conservation and Use of Agricultural Land Resources"	3,000,000	3,500,000	4,000,000	+ 500,000

\* (Detailed statements of allotments by commodity projects preface the statements on the research activities of each laboratory appearing on the following pages).

Northern laboratory	Page 124
Southern laboratory	Page 131
Eastern laboratory	Page 135
Western laboratory	Page 140



INCREASES, OR DECREASES

(1) An increase of \$500,000 (\$125,000 per laboratory) is required for the operation of the four regional research laboratories, to the full extent for which they are being equipped and staffed in accordance with the authorization for their establishment.

Objective: To provide for carrying out the research programs of the four regional laboratories as authorized and directed by Section 202 (a) to (e) inclusive of the Agricultural Adjustment Act of 1938, and on the full scale for which plant and equipment and research staff have been provided, and with particular reference to the full application of the facilities and staff of these laboratories to those research projects of importance to the Nation in the present emergency.

The problem and its significance: In 1938 Congress recognized the need for greater industrial outlets for farm crops, particularly the surpluses, and authorized an annual appropriation of \$4,000,000 for the establishment and maintenance of four regional research laboratories, one for each of the major agricultural producing areas of the country, to search for new and wider industrial outlets and markets for farm commodities.

In the initial appropriation of \$4,000,000 (Fiscal year 1939) Congress directed that a survey be made (a) to gather information on research already under way on the industrial utilization of agricultural products; (b) to determine the scope of the research to be undertaken in the laboratories; and (c) to assemble data for the location of the laboratories. The survey revealed that there is ample justification for the annual expenditure of \$4,000,000 for this research. With this established the laboratory buildings were designed and constructed to provide the facilities and house the personnel required for a research program of this scope.

The authorization of \$4,000,000 a year for these laboratories was reduced by Congress to \$3,200,000 in the fiscal year 1940 and to \$3,000,000 in 1941 on the basis that the facilities could not be completed in time to permit employment of the personnel provided in the budget estimates. The Budget Estimate for the fiscal year 1942 of \$4,000,000 was reduced by Congress to \$3,500,000. In reporting the Agricultural Bill to the House, the House Appropriations Committee stated that as none of the laboratories would be completed until December 1941, and part of them probably not until a later date, the Committee felt that the amount provided in the Bill (\$3,500,000) would be sufficient to allow operation of the laboratories to the fullest extent for which they would be equipped during the fiscal year 1942. The laboratories will be equipped and staffed by June 30, 1942, and \$4,000,000 will be required for fiscal year 1943 in order to operate on a full-year basis with the personnel employed by the end of fiscal year 1942.





A national emergency exists in which the utilization of our surplus agricultural commodities for the replacement of strategic and critical raw materials is of the greatest importance to the civil population as well as to the armed forces. The probability of shortages is further aggravated by the curtailment or complete stoppage of many vital raw materials which in the past have been imported. Intensive chemical and technical research is necessary to develop to the fullest extent the potentialities existing in agricultural commodities and byproducts. The appropriation of the full \$4,000,000, originally authorized for the four regional laboratories, is imperative if the laboratories are to be in a position to cope with this situation to the fullest extent.

(2) An increase of \$2,200 in Central Administration Planning and Coordination offset by a decrease in transfers as shown in the budget schedule. This increase of \$2,200 is required to provide for full-time salary obligations during the fiscal year 1943 of personnel employed only part time during 1942.

#### WORK UNDER THIS APPROPRIATION

Objective: To develop, by research, new scientific, chemical and technical uses and new and extended markets for farm commodities such as corn, wheat, cotton, sweetpotatoes, peanuts, apples, vegetables, tobacco, milk products, animal fats and oils, potatoes, tanning materials, hides, skins and leather, alfalfa, fruits, poultry, and agricultural residues, with special emphasis on the development of replacements or substitutes for critical and strategic materials urgently needed to support the National Defense program.

The problem and its significance: In a realistic research program to increase industrial utilization of farm commodities and byproducts, emphasis must be adjusted to prevailing economic conditions.

The change in our domestic and foreign economy, resulting in increased needs for industrial raw materials, makes imperative the necessity for extended chemical and technological studies in order that new sources of raw materials may be made available to industry when present supplies are utilized in other channels. Certain materials now considered indispensable to national economy are imported from parts of the world which may momentarily be closed to the United States. Replacements of these materials or adequate substitutes must be sought at once. A program devoted to the alleviation of the expected conditions of economic stress will open the way for new and expanded markets for farm commodities now and in the future.

For example, from 100 to 200 million tons of residues and waste materials are produced for which there has been little or no use as well as a vast yearly production of cull and below grade products. Immediate effort must be directed to (1) increased crop production to meet increased food needs, (2) development of a high degree of industrial utilization of agricultural products not suitable for food purposes.

Products heretofore discarded, as well as those used for food, have been found rich in important chemical components such as cellulose, hemicellulose, lignin, casein, proteins, oils, starches, pectins, acids, waxes, and probable conversion of many of these components to plastics, synthetic rubber, motor fuels and lubricants, building materials, cloth filler and substitutes, fiber boards, protein meals, films, adhesives, sugar soaps, medicines, pharmaceuticals, solvents, hormones and other vital commodities is foreseen.





Pilot plant studies will have to be conducted to develop the commercial uses of these factors being extracted in the chemical laboratories and to improve industrial methods employed on other substitutes and replacement materials, the quality of which is too low or the cost of production too high.

Each new development in increasing production, finding new industrial uses and substitutes and replacement materials will materially relieve growing shortages occasioned by curtailed imports and increased defense needs.

General plan: The research work under this appropriation covers the principal agricultural commodities produced in the 48 states. It is planned to determine in the laboratory by chemical, physical, and biological research the nature of the products under investigation and, subsequently, on a pilot plant scale, the practical possibilities of their conversion into marketable products.

The purpose is to stimulate industries, as the Department has done frequently in the past, by showing the possibilities of financial profit from the processing of agricultural commodities.

Efforts will be concentrated on the development and improvement of processes which will make possible the profitable production of industrial products for which there is a present or potential demand.

Emphasis will be placed on the utilization of culls and low-grade products. Indicated below are the States to be served together with the commodities to be given initial attention by each of the laboratories:

Northern Laboratory, Peoria, Illinois  
Area                      Commodities

Illinois	Agricultural
Indiana	Residues
Iowa	Corn
Kansas	Wheat
Michigan	
Minnesota	
Missouri	
Nebraska	
North Dakota	
Ohio	
South Dakota	
Ohio	
South Dakota	
Wisconsin	

Southern Laboratory, New Orleans, La.  
Area                      Commodities

Alabama	Cotton
Arkansas	Sweetpotatoes
Florida	Peanuts
Georgia	
Louisiana	
Mississippi	
Oklahoma	
South Carolina	
Texas	



Eastern Laboratory, Wyndmoor, Pa.

<u>Area</u>	<u>Commodities</u>
Connecticut	Apples
Delaware	Vegetables
Kentucky	Tobacco
Maine	Milk Products
Maryland	Potatoes
Massachusetts	Animal Fats and
New Hampshire	Oils
New Jersey	Tanning materials
New York	hides, skins,
North Carolina	and leathers
Pennsylvania	
Rhode Island	
Tennessee	
Vermont	
Virginia	
West Virginia	

Western Laboratory, Albany, Calif.

<u>Area</u>	<u>Commodities</u>
Arizona	Apples
California	Alfalfa
Colorado	Fruits
Idaho	Potatoes
Montana	Vegetables
Nevada	Poultry
New Mexico	Wheat
Oregon	
Utah	
Washington	
Wyoming	

It will be noted that research on certain of the commodities has been divided between two laboratories. Such division of effort is based on the importance of the commodity under investigation in the regional areas to which assigned. Careful consideration has been given to the composition of these commodities which suggest different types of utilization and to the coordination of the research activities of the laboratories concerned.

A composite statement of these joint commodity projects is given below. Complete project statements for each laboratory appear on subsequent pages.

<u>Northern Lab.</u>	<u>Eastern Lab.</u>	<u>Western Lab.</u>	<u>Total</u>
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Wheat Utilization  
investigations:

1941 Actual.....	61,027	- -	33,390	94,417
1942 Allotment.....	100,000	- -	69,100	169,100
1943 Estimate.....	125,000	- -	87,400	212,400

Apple utilization investigations:

1941 Actual.....	- -	40,648	26,289	66,937
1942 Allotment.....	- -	61,000	73,700	134,700
1943 Estimate.....	- -	87,000	93,200	180,200

Vegetable crop utilization  
investigations:

1941 Actual.....	- -	22,083	104,524	126,607
1942 Allotment.....	- -	24,750	136,000	160,750
1943 Estimate.....	- -	34,750	172,000	206,750

Potato utilization investigations:

1941 Actual.....	- -	65,759	19,038	84,797
1942 Allotment.....	- -	96,000	39,500	135,500
1943 Estimate.....	- -	136,000	49,300	175,300



Examples of progress and current programs: The research program for each laboratory by commodities is briefly discussed in the following statements:

NORTHERN REGIONAL RESEARCH LABORATORY  
PROJECT STATEMENT

Project	1941	1942 (estimated)	1943 (estimated)
1. Construction and equipment of building.....	\$194,419	\$118,500	\$ 8,000
2. Agricultural residues utilization investigations.....	149,224	215,000	265,000
3. Corn utilization investigations.....	284,646	402,250	542,750
4. Wheat utilization investigations.....	61,027(a)	100,000	125,000(a)
5. Technical features of construction and design.....	8,395	- -	- -
6. Plans and specifications and supervision of construction.....	15,911	- -	- -
7. Unobligated balance.....	3,628	- -	- -
Total.....	717,250	835,750	960,750

(a) Joint project with Western laboratory.





Examples of Progress and current programs:

1. Construction and equipment of building:

Actual construction of all the units comprising the Northern Regional Research Laboratory, with the exception of one small underground solvent storage vault estimated at \$8,000, has been completed and final phases of installation of equipment are in process. All of the requested buildings and equipment of the laboratory will be completed and operating under full capacity by the end of the fiscal year 1942 with the exception of the above mentioned storage vault.

2. Agricultural residues utilization investigations:

The threatened cellulose pulp shortage and increasing use of plastic for military and civil needs emphasizes the dependence of increased industrial utilization on more economical methods of collection. Cooperative experimental harvesting studies by agricultural equipment manufacturers, state experiment stations, and other divisions of the Bureau, we carried out in six states with emphasis on the best equipment and the lowest cost operating methods for combining, collecting, and baling wheat straw and cornstalks. Results show definite improvement in quality of straw, simplified operation of machinery, and lowered collection costs not only for industry but also for the farmer.

To answer criticism by industry of the quality of straw obtained from wheat harvested by combines, complete chemical and physical analyses on industrial straw types have been completed to a point where it is evident that combined straw, properly handled, is equal to, and from a point of cleanliness superior to stack straw which is gradually disappearing as a raw material source.

Survey work on the location, local cost, concentration, and availability of agricultural residues such as corncobs and wheat straw has been continued and at the request of the War Department on barley, rye, and rice straw.

Agricultural residues are composed chemically of celluloses, hemicelluloses, and lignin. The basic attack on the utilization of these residues is now under way to develop some money return from each of these constituents. Many inquiries from within this country as well as from South America, have been answered concerning possible uses of agricultural residues for making alpha-cellulose and paper. At the request of the War Department alpha-cellulose samples are being prepared from barley, rye, wheat, and rice straw to fill highly specialized requirements.

The emphasis on lignin utilization is directed toward the production of plastics. Phenol and formaldehyde are in particular scarcity at this time, but furfural, now produced commercially from oat hulls and possibility of manufacture from corncobs, bagasse, and straws, is replacing



formaldehyde in certain plastics. Furfural is obtained at low cost by chemically changing the hemicelluloses of agricultural residues. The potentially available tonnage of furfural is tremendous. Work now under way on lignin plastics is directed toward opening up the phenolic combining power of lignin and using furfural and other chemicals of agricultural origin to supply plastic deficiencies. Investigations are actively under way on the production of synthetic rubber intermediates from agricultural residues by way of furfural. A pilot plant for plastics production is completed and definite progress is being made.

Work is being undertaken on the gums which may be extracted from corncocks, flax shives, and straws. These gums may find definite uses in the present need for substitutes in a number of industries.

To develop uses for residues in a largely unchanged state or with a minimum of mechanical processing, laboratory work has been initiated in three different fields. (1) Development of low cost building materials for manufacture and use, particularly on farms and in rural communities, which is a problem designed to assist not only during the present emergency but also in the post war period. (2) Assistance in the search for cork substitutes. (3) Gaseous motor fuels. Experimental investigations have led to considerable progress in the design and operation of a down-draft type generator for the production from corncocks, or other residues, of a gaseous fuel suitable for use in internal combustion motors and for heating and cooking. The generator, in its present experimental stage, yields gas of a thermal content which indicates that cobs from one bushel of corn are equivalent on a fuel basis to one-half gallon of gasoline.

A special assignment on the investigation of the use of the water chestnut plant for making paper or building board products has been completed. These water chestnut plants seriously obstruct navigation in the Potomac River and must be periodically cleaned out in certain areas by engineers of the War Department. The laboratory investigations indicate that this plant is not suitable for the manufacture of paper or cellulose pulps. These same features make the chestnut plant equally unsuitable for building board manufacture. The most logical use for the plant would be for local composting for addition of the final product to the soil and feeding of the nuts to stock. Work done on the water hyacinth plant for similar uses indicates the same conclusion.

### 3 . Corn utilization investigations:

Of special importance from the standpoint of the Ever-Normal Granary program is the long time storage of corn under conditions insuring a high degree of preservation. Storage corn is subjected to constantly varying





humidity and temperature conditions, and the effects of artificial drying prior to storage, temperature, humidity, and preservatives, upon the constituent of the stored corn are practically unknown. Work is therefore being conducted on the collection of different varieties of corn stored from a few to as many as twenty years, laboratory processing of these samples for the production of starch. Experimental results obtained thus far indicate:

- (a) That the properties of some varieties of corn kept under good storage conditions for a few years are altered to only a slight degree.
- (b) Storage of pure starch for as long as twenty-five years does not modify its properties appreciably.
- (c) Steeping processes of corn as practiced by industry profoundly affect the properties of starch.
- (d) State of maturity markedly affects the ease of the processing of corn for starch production.

Tapioca starch and tapioca starch dextrins are used to the practical exclusion of corn starch and other dextrins by adhesive and plywood industries, due to superior adhesive power, stability toward varying atmospheric conditions, clarity of thin films, and ease in manipulation of water solutions. Replacement of tapioca starch and its dextrins by materials of domestic origin is of obvious importance, in view of the possibility that imports of tapioca starch may be cut off. Replacements are being sought by the laboratory in two different ways: (1) By thorough investigation of waxy maize starch, and (2) by the development of methods for producing from common corn starch dextrins having properties similar to those from tapioca. In cooperation with agronomists of the Department and State agricultural experiment stations, several hundred bushels of waxy maize have been collected. Waxy maize starch has some properties quite similar to those of tapioca. Pastes have been experimentally reproduced from waxy maize starch which are thin, gelatinous, and almost clear, in contrast to pastes of ordinary corn starch which are thick, ropy and opaque.

The possible utilization of corn starch and corn sugar for the production of low cost synthetic fibers, films, and plastics, has been considered from time to time in the past. Experimental work is now under way on (1) the separation of laboratory and industrially processed corn starch into its components; (2) the determination of the constancy of the ratios of the components from different sources of starch; (3) determination of the physical and chemical properties of starch components; (4) modification of purified starch or its components into derivatives having useful plastic and fiber and film-forming characteristics; (5) catalytic polymerization of corn sugar for the production of high molecular weight compounds; (6) modification of polymerized





corn sugar products to derivatives having plastic properties; (7) condensation of corn sugar or its derivatives with polymerizing agents for the direct production of plastics. Thus far it has been possible by laboratory methods to separate 25 percent of corn starch produced comparable to cellophane in appearance and strength. Corn sugar has been converted to clear, pale yellow plastic materials, the properties of which are now being investigated.

Essential organic raw materials may be produced from corn starch and corn sugar, such as glycerol, tartaric acid, mannitol, sorbitol, lactic acid, and related compounds. Attention is being given to the following investigations: (1) Hydrogenolysis of starch and corn sugar for the production of glycerol and propylene glycol; (2) oxidation of starch and corn sugar to glucuronic acid, saccharic acid, and tartaric acid; (3) alkaline degradation and isomerization of corn sugar to fructose and other organic raw materials; and (4) thermal modification of starch and corn sugar for the production of lacvo-glucosan, a starting material for the production of a series of other compounds.

Application of fermentation reactions to agricultural commodities having a high carbohydrate content or to the sugars prepared from such crops as corn, is a highly important field of experimentation. In addition to industrial alcohol production, products now manufactured by fermentation of carbohydrate material include citric, lactic and gluconic acids, acetone, butyl alcohol and other products of less importance. This important field is being actively investigated from new types of fermentation processes and products. To this end there have been collected and identified over three thousand strains of industrially significant yeasts, molds, and bacteria, the finest collection of potentially valuable industrial micro-organisms in this country, if not in the world. A similar collection assembled in Holland has to all intents and purposes been lost so far as this country is concerned, by the Nazi occupation.

Experimental investigations in this laboratory have shown that 13 percent corn sugar solutions can be fermented to 2-Ketogluconic acid by bacteria of the genus *Pseudomonas*, 80 percent yields being obtained in thirty hours. This fermentation process has now been developed to the point where industry is definitely interested. During the past year six chemical companies have taken out licenses to operate the process covered by a patent application made by members of the research staff.

Laboratory investigations have shown that bacteria of the genus *Acetobacter* can ferment cheap grades of corn sugar to 5-ketogluconic acid in good yields. Three chemical companies have taken out licenses during the past year to operate this fermentation process, which is covered in a patent application by members of the research staff. 5-Ketogluconic acid may be converted to tartaric acid by oxidation. Tartaric acid is at the present time extremely high priced and almost impossible to obtain in large quantities because of the disruption of trade with continental Europe,



Studies relative to the fermentation of corn sugar to 2,3-butylene glycol have shown that 80 percent yields may be obtained in a thirty hour fermentation. 2,3-butylene glycol is a possible source material of great interest for the production of butadiene, which is the starting material for the production of the buna types of synthetic rubber, and which also has properties which make it useful as an antifreeze, humectant, solvent, and for plastic production. Much of the small scale laboratory work has been completed on this problem, and the development of pilot plant testing of the process is now in progress. Results obtained so far indicate that a commercially feasible recovery process can be developed. The experimental work thus far completed on the direct fermentation of corn mash and in recovery of the butylene glycol, are very promising, and thus open up the use of corn as a raw material for synthetic rubber production and in other industrial fields.

Itaconic acid is a raw material which may be used for the production of plastics of a clear, glass-like type such as Lucite, or Plexi-glass. The laboratory has been intensively investigating the development of a process for the production of itaconic acid by the fermentation of corn sugar by species of Aspergillus. The yield of itaconic acid from corn sugar has been increased tenfold by experimental work, and has now reached the point where, on the basis of the laboratory experiments, it is indicated that it may be manufactured for a price which will make it an attractive industrial raw material. However pilot plant studies are not as yet feasible.

At the request of the Rockefeller Foundation and the National Research Council, laboratory facilities and assistance have been made available to guest workers for investigations directed toward improvement in the yield of Penicillin, a mold metabolic product. Penicillin will destroy pathogenic bacteria in dilutions as high as one to five million, and has properties which make it almost ideal as a therapeutic agent. If yields of Penicillin could be increased to a point where it could be produced commercially, it might well constitute the greatest advance in the treatment of infections since the sulfonamide drugs were developed. Members of the research staff have been able to increase the yields of Penicillin about eightfold.

A serious situation has developed with respect to supplies of tung oil in this country. This oil, in normal times, is imported in large quantities from China for use in varnishes, lacquers, printing inks, and in the general protective coating field. An important investigation of this laboratory deals with experiments to change chemically the structure of fatty acid glycerides of corn oil to chemical structures similar to those which occur in the fatty acid glycerides in tung oil and which are responsible for the unique characteristics of the latter oil. It has been established on a laboratory scale that certain catalysts are capable of bringing about this change to a considerable extent. This process, should its pilot plant development prove successful, will be applicable not only to corn oil, but to other semi-drying oils such as cottonseed and soybean oils.





Synthetic coatings similar in structure to those made from modified alkyd resins, of which there is now a serious shortage, have been made in the laboratory entirely from corn oil. Should this work develop as favorably as is indicated at present, such coatings should find important industrial use in fields now occupied by the important glyceryl-phthalate and urea-formaldehyde coatings.

A new process for extracting zein from corn gluten is now in the course of development. Zein produced by this method is more water resistant, more resistant to spoilage, and appears to be a better paper coating plastic than commercial products now available.

Equipment for the experimental alcohol pilot plant has been purchased, and the erection of this plant has now been practically completed. The pilot plant has been designed to give maximum flexibility of operation and the minimum basic size for adequate production cost and process studies on all phases of producing alcohol or related compounds from any agricultural carbohydrate material with complete recovery of all by-products. It is anticipated that when experimental work utilizing this plant is completed, accurate evaluation will be made of the costs of production of alcohol and similar materials from agricultural commodities, based on the use of the most efficient and improved procedures and operations.

Specifications for internal combustion engine equipment for evaluation of motor fuels developed from agricultural materials have been developed, and the equipment purchased through bid. Standard authorized test procedures will be used. Theoretical thermodynamic functions similar to those developed for petroleum products have been evaluated for the processes of combustion of alcohol in internal combustion engines. Thermodynamic properties of agricultural motor fuels, compounded fuels, and entrainment agents and corrosion characteristics of agricultural motor fuels, inhibitors, and adjuncts are being studied.

A pilot plant has been designed and equipped, and is now being installed for a study of the wet processing of corn and waxy maize. A large number of corn samples representing varieties of commercial importance of both open pollinated and hybrid types were collected for research purposes in cooperation with the Bureau of Plant Industry and the State agricultural experiment stations. Close contact has been made with these agencies in order that they may be fully informed at all times of the work program of the laboratory on corn utilization investigations.

#### 4. Wheat utilization investigation:

Many of the studies enumerated for corn are being concurrently conducted on wheat. This particularly true of the starch investigations and oil investigations. The experimental results assembled in the agricultural motor fuels investigations, as well as the fermentation studies, apply in large measure to wheat. A large number of wheat samples of known variety and history have been collected in cooperation with the Bureau of Plan





Industry and the State agricultural experiment stations and are being subjected to detailed chemical analysis. These analytical results will be furnished to other agencies interested chiefly in milling and baking studies in order that they may be properly evaluated and applied in those investigations. Preliminary studies are under way on the evaluation of amylase activities of wheat for possible uses in saccharification operations in connection with the development of mashes suitable for production of alcohol in the pilot plant. Experimentation is under way on the wet processing of wheat for the production of wheat starch and oil, particularly from low grade grain. At present this work is being carried out on a laboratory scale, chiefly for the production of starch. Very interesting preliminary results have been obtained which are of definite promise for radical improvement of present production methods. No conclusions can be drawn until the laboratory scale experiments can be conducted in the pilot plant now being erected for the processing of corn to starch, protein and oil.

## SOUTHERN REGIONAL RESEARCH LABORATORY

## PROJECT STATEMENT

Project	1941	1942 (estimated)	1943 (estimated)
1. Construction and equipment of building..	\$171,583	\$94,500	\$94,500
2. Cotton utilization investigation.....	422,857	592,970	\$783,500
3. Sweetpotato utilization investigations..	47,356	103,786	132,566
4. Peanut utilization investigations.....	34,246	44,494	57,644
5. Technical features of construction and design.....	7,500	- -	- -
6. Plans and specifications and supervision of construction.....	21,056	- -	- -
Total,,,,,,	694,598	835,750	960,750

Examples of progress and current programs:

1. Construction and equipment of building: Actual construction of all the units comprising the Southern Regional Research Laboratory has been completed and final phases of installation of equipment are in process. All of the requested buildings and equipment of the laboratory will be completed and operating under full capacity by the end of the fiscal year 1942.
2. Cotton utilization investigations: In a cooperative project with the Agricultural Adjustment Administration on their distribution program of hairy vetch and Austrian pea, the following reports and publications have been prepared under this project:



(a) "Trends in the Consumption of Fibers in the United States, 1892-1939," by R. B. Evans and R. F. Monachino, (Multilithed).

(b) "Registered Trade Names Applicable to the Finishing of Cotton Textiles," by Ruby K. Worner and Walter M. Scott, (Multilithed).

(c) "Cotton Research Program of the Southern Regional Research Laboratory," by R. J. Cheatham. Report presented before the International Cotton Advisory Committee, Washington, D.C.

(d) "Crystal Density of Native Cellulose," by W. James Lyons. Published in Journal of Chemical Physics, April, 1941.

Due to the National Defense program, the following shifts have been made in our cotton and cotton byproducts utilization investigations.

Cotton lint for nitration- Supplies of chemical grades of cotton linters are inadequate to meet the War Department's estimated demand for smokeless powder. Investigations on a laboratory scale demonstrated that cotton lint cut to appropriate lengths can be substituted for cotton linters for nitration and manufacture into smokeless powder. Two types of commercial cutting machines have been selected and purchased for determining the commercial feasibility of using lint cotton for this purpose. Through the cooperation of the Hercules Powder Company, the Council for National Defense, and the Indianhead Naval Powder Factory, approximately 10 tons of lint cotton (40 bales) have been cut, purified, nitrated, and manufactured into smokeless powder on commercial equipment.

Sandbags - Investigations have been conducted on the treatment of cotton, bagging to protect it against destructive organisms such as mildew, and to extend its life when used as a container for sand or dirt. For adequate protection it was found that the copper "take-up" had to be greater than commercial process directions. The proportion of copper could be substantially reduced if used in conjunction with a binder or water-proofing agent. An accelerated soil burial test was developed to duplicate in 3 or 4 weeks the destructive action experienced in about a year of actual use of the fabric as a sandbag.

Cotton insulation against piercing by projectiles - Experiments have demonstrated that at densities of 30 lbs. per cubic foot and over, a bale of cotton will successfully resist penetration by bullets fired from an (0.30-caliber) Enfield army rifle. It is planned to extend these experiments in cooperation with the War Department with larger size ammunition and with bombs in order to evaluate the protective effect of cotton as a means of protection.

Black-out cloth - Investigations on the use of cotton fabrics for black-out purposes in defense against aerial attacks are under way. Surveys of the industry to find out the types of suitable cotton cloth which can be produced in enormous quantities have been made. The suitability of cotton cloth and cotton lint as filler in plastics for molding protective helmets and street lamp shades has been investigated.





Two other cotton utilization problems important to National Defense are now being studied from an economic and technological standpoint - (1) cotton bags for packaging agricultural commodities which are now packaged mostly or wholly in jute burlap bags, and (2) cotton binder twine for harvesting wheat crops now harvested with twine made from fibers which are imported.

Cottonseed products investigations - During the past year effort expended on this project has been directed toward designing, purchasing, assembling and installing the apparatus and equipment required for carrying out assigned investigations on cottonseed and its derived products. Except for pilot plant processing equipment, this phase of activity is substantially completed. Except for some equipment on which it has not been possible to obtain delivery, facilities are now available for prosecuting work on a number of cottonseed projects. Investigations on the effect of cooking on the gossypol in cottonseed meats have been made in cooperation with an oil company.

Development of a "tailor-made" oil as a substitute for palm oil: In cooperation with member firms of the tinplate industry, investigations on imported palm oil are being made. The desirable properties and characteristics which make it serviceable in the tinplate bath, its breakdown in the tinplate bath, and the characteristics and properties of the spent palm oil are being investigated to synthesize from cottonseed oil a tailor-made substitute for the tinplate industry

The cottonseed protein investigations are being shifted toward the development of suitable adhesives and sizes due to the dire need for these classes of materials in our defense stepped-up manufacturing program.

3. Sweetpotato utilization investigations: During the past year the greater part of the effort expended on these projects has been directed toward designing, purchasing, assembling, and installing the apparatus and equipment required for carrying out assigned investigations on sweetpotatoes and their derived products. Except for pilot plant processing equipment, this phase of activity is substantially completed. Expanded investigations are under way toward the evaluation of new varieties of sweetpotatoes for starch content and processing quality; modification of the starch manufacturing process to reduce cost and to improve the yield, quality and uniformity of the product; and the development of methods of storage of sweetpotatoes without impairment of quality for industrial utilization. Progress in (1) the preparation of sweetpotatoes for grinding by cutting or chipping; (2) dehydration of the slices or chips for dry storage; (3) uniform coloring of starch, without altering its physical properties; and (4) in the modifying and blending of sweetpotato starch to controlled uniform grade as to viscosity of pastes required in the textile industry.

Due to the restricted supply of imported starches and the similarity of sweetpotato starch to these imported starches, the commercial production of sweetpotato starch at the Laurel plant is being shifted to fill our national needs at this time. At the request of Farm Security Administration, a survey of the physical plant and a technical analysis of the records of the plant was made. As a result of this survey, imported systems for modifying and blending starch; for accurate plant control by weighing of raw potatoes and finished starches; changes for reducing explosion hazards; and improved preparation of stock, by chipping, have been put into practice. Farm Security Administration allocated \$16,000 to buy the equipment and to set in operation these changes. These installations were completely designed by this staff and the detailed and shop drawings for the manufacture of this equipment all were made at the Southern Laboratory. The Laurel plant will be able to supply the various grades of starch now in heavy





demand due to restricted imports.

Arrangements have been made also for assisting the United States Sugar Refining Company at Clewiston, Florida which is erecting a sweetpotato starch plant in Florida. Progress has reached the design stage.

4. Peanut utilization investigation: During the past year the greater part of the effort expended on this project has been directed toward designing, purchasing, assembling and installing the apparatus and equipment required for carrying out assigned investigations on peanuts and derived products. Except for pilot plant processing equipment, this phase of activity is substantially completed. But for some equipment on which it has not been possible to obtain delivery, facilities are now available for prosecuting work on a number of peanut projects.

At the request of the Fat Analysis Committee of the American Oil Chemists' Society, work has been under way for some months on the detection of peanut oil in other edible oils. Results to date indicate that although the arachidic acid method is reasonably accurate when applied to pure peanut oil and to soybeans-peanut oil mixtures, it is not applicable to cottonseed-peanut oil mixtures.

The solid acids present in cottonseed oil apparently interfere with the crystallization and separation of the arachidic acid of the peanut oil. Substitutes of a magnesium salt-separation method for the official lead salt-separation method in the case of cottonseed-peanut oil mixtures has shown promise of practical applications. An investigation, also made at the request of the Fat Analysis Committee of the American Oil Chemists' Society, of the hexabromide method for determining the presence of unsaturated fatty acids in various vegetable oils has indicated that the method is wholly unreliable.

Due to the National Defense Program the following shifts have been made in the peanut oil projects: (1) Because of the stringent supply of imported hard wax, investigations are under way to establish the constitution of a hard wax, presumably prepared from peanut oil and until recently imported into this country. Efforts are being made to duplicate this wax, starting with domestic peanut oil. This wax is a high-priced product and is in demand because it imparts a high gloss to patent leathers. It is also used in cosmetics and in certain metals and other finishing agents. A suitable substitute for imported olive oil is very necessary to our defense program. (2) Investigations are under way to produce a "tailor-made" oil from peanut oil which can replace olive oil in our textile industry. (3) In like manner substitutes for the olive oil used in the woolen industry are being searched for. In the woolen industry refined mineral oil and coconut oil (2:1) is now being used. There is a possibility that we will not obtain the desired amount of coconut oil. (4) Investigations in peanut proteins are being prosecuted to replace trade adhesives and sizes which industry is finding hard to obtain at this time in our "stepped-up" National Defense industrial program.



EASTERN REGIONAL RESEARCH LABORATORY

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)
1. Construction and equipment of building..	\$213,000	\$160,000	\$ - -
2. Apple utilization investigations.....	40,648(a)	61,000(a)	\$ 87,000(a)
3. Vegetable utilization investigations....	22,983(b)	24,750(b)	34,750(b)
4. Tobacco utilization investigations.....	87,947	125,000	183,000
5. Milk products utilization investigations	133,000	188,000	258,000
6. Animal fats and oils utilization investigations.....	91,487	132,000	203,000
7. Potatoe utilization investigations.....	65,759(c)	98,000(c)	126,000(c)
8. Tanning materials, hides, skins, and leather utilization investigations.....	34,493	49,000	69,000
9. Technical features of construction and design.....	7,454	- -	- -
10. Plans and specifications and supervision of construction.....	14,199	- -	- -
Total.....	712,070	837,750	960,050

(a), (b), and (c) Joint commodity projects with the Western Laboratory.

Examples of progress and current program:

Construction and equipment of buildings: Actual construction of all the units comprising the Eastern Regional Research Laboratory has been completed and operating under full capacity by the end of the fiscal year 1942.

Apple utilization investigations: Extensive literature searches in connection with apple investigations were made on the following subjects; Apple juice processing; preparation of apple concentrate; chemical and physical characteristics of the volatile esters of apples; apple wax, pectin, and galacturonic acid.

Because of the present great need for concentrated food products to conserve storage and shipping space, considerable emphasis has been placed on the preparation of a concentrated apple juice with full retention of the volatile flavoring ingredients. A chemical method for the determination of the volatile esters of apples has been developed, by use of which it has been possible to follow the volatile esters quantitatively through various juice processes. Large scale studies were carried out at Sterling, Massachusetts, in cooperation with the Sterling Cider Company. Due to loss of volatile esters, it was found that ester impregnation of the concentrated juice is not feasible. These results were of value in designing a pilot plant scale apple juice concentrator. The method may be generally applicable in the concentration of other fruit and vegetable juices.





A cooperative arrangement has been made with the Delaware State Experiment Station for the Pilot Plant development of a new type of apple pectin.

Vegetable utilization investigations: Because of the importance of having adequate sources of riboflavine and of carotene, research on the vegetable project is being concentrated largely on these two vitamins. A large variety of truck crops and their wastes have been collected, dried quickly at moderate temperatures, and stored in tight containers. They are being assayed for these vitamins by the best known current methods, and the most promising materials are being further examined for the possibility of preparing from them concentrated preparations by commercially feasible methods. The immediate objective is preparations suitable for feed adjuncts, since these are probably more quickly attainable. Following this, more highly purified preparations, suitable for pharmacy, will be attempted.

Intensive efforts are being devoted to the development of processes for the utilization of vegetable wastes accumulating at packing houses, canneries, freezing plants, dehydrators, and other processing industries, and wastes left or accumulated in the fields. Economic studies on lima bean and pea vines that accumulate around canneries and freezing plants were made with a view to a more profitable means of utilizing this material.

It was considered that the artificial method and machinery of drying alfalfa might be utilized directly for the drying of lima bean and pea vines, as these materials are quite similar to alfalfa. Several tons of these vines were dried, and most of the dried product has been sent to the Bureau of Animal Industry at Beltsville, Maryland, for feeding trials. Part has been kept for detailed laboratory study of its constituents.

Tobacco utilization investigations: Special emphasis is being placed on the following phases of tobacco chemistry and technology: (1) nicotine - its occurrence and use as an insecticide (2) nicotinic acid (3) chemical constituents of tobacco, especially the aromatic compounds.

Laboratory and pilot plant studies on recovery of nicotine from tobacco by vacuum distillation have shown that nicotine concentrates of from 6% to 70% may be obtained by this process. Furthermore, when nicotine solutions of greater than 7% concentration are heated to 70 or 80 degrees, nicotine of 80% concentration forms as a separate lower layer and can be withdrawn. These results indicate a possible new method for preparation of nicotine from tobacco, and extensive pilot plant studies for recovery of nicotine from tobacco by vacuum distillation will be undertaken as soon as suitable equipment can be installed.

A considerable number of new nicotine compounds of the nature of double salts have been prepared and it is planned to test these, as well as other new compounds to be prepared later, for their insecticidal value. Research work to develop new carriers for nicotine was initiated, and of the materials tested so far, two, ground rubber and cellulose fibers, appear to have promise, especially when the nicotine can be fixed in the fiber. In view of impending further shortage of shipping facilities, substitute materials for imported insecticides such as pyrethrum, must be developed as soon as possible. Greater emphasis is being placed on the development of new and improved forms of nicotine insecticides.





Field trips were made for the purpose of determining the amount of nicotinic acid that will probably be used and the competitive status of nicotine as a source of nicotinic acid. Because of the promise of increased outlets for nicotine as a source of nicotinic acid for vitamin supplementation of wheat flour, and to meet the large requirement of Great Britain, far greater emphasis is now being placed on the development of improved methods for its conversion to nicotinic acid.

Experiments designed to isolate and characterize the aromatic compounds in tobacco have been initiated and considerable progress has already been made. The knowledge gained so far is being used to plan large-scale operations for isolation of these aromatics in quantities sufficient for purification and identification.

Milk products utilization investigations: In view of emergency requirements research on milk products is now being devoted along lines which should yield immediately practicable results in (1) improving the characteristics of protein plastics to make possible their substitution for other plastics and metals required for vital defense needs; (2) development of artificial protein fibers suitable as wool replacement materials; (3) the production from lactic acid (derived by fermentation from whey) of acrylate resins and of important intermediates for the manufacture of certain synthetic rubbers.

The program of research is being developed along two main lines. (1) Development of utilization of milk proteins for commercial use and (2) Investigations on the production and utilization of lactose and its derivatives. Included in the investigations of milk proteins are studies of the basic composition and properties of proteins.

The most extensive experiments have been directed along the lines of the fractionation of casein and whey proteins with inorganic salts and acids and with certain organic acids. Those investigations are thus far exploratory and no preliminary conclusions can be drawn at this stage of the work. Work has also begun on a study of the absorption of water from the vapor phase by proteins, peptides and amino acids. An apparatus has been devised and constructed for the purpose, and twenty-seven substances subjected to initial investigation. This study is expected to have important bearings on improving protein plastics and fibers. Very considerable attention has been given to the initiation of artificial protein fiber investigations. A flexible and accurate apparatus for experimental production of fiber has been designed and will soon be constructed and put in operation.

Initial laboratory work thus far on products derived from lactose has been concerned with efforts to convert lactic acid economically into acrylic esters and acrylonitrile, which are important intermediates in the manufacture of acrylate resins and certain synthetic rubbers. Methyl lactate has been pyrolyzed in the presence of both nitrogen and ammonia, using either quartz or alumina as contact materials. Considerable study is required to assess the potentialities of these pyrolytic processes and to find optimum conditions. Since lactimide is of interest as a possible competitor of acetamide in fields requiring special solvents and as an intermediate in the synthesis of acrylonitrile, considerable attention has been given to the preparation of lactimide from lactic acid. Although this study is not complete, attempts made to prepare lactimide by treating methyl lactate with (1) ammonium hydroxide (aqueous), (2) ammonium carbonate, and (3) anhydrous ammonia were successful in each instance.



Animal fats and oils utilization investigations: Emphasis is being placed initially on (1) development of methods of chemical modification of animal fats and oils to produce new products suitable for technological application, and (2) quality and stability studies aimed at improvement of the present methods of production, processing, and preservation of animal fats as well as the development of new methods so as to obtain more uniform products of better quality and greater suitability for present uses.

During the past year work was begun for the Chemical Warfare Service on the selection of a reagent which would improve the penetrating properties of mustard gas decontaminants. A large number of commercial penetrants were tested and several compounds were found to be satisfactory for use with both bleaching powder and hypochlorite, one of them being particularly well suited for the purpose. All laboratory aspects of this problem were completed and the results submitted to the War Department for their use.

Because of curtailed facilities in shipping which have brought about impending shortages of coconut and other imported oils, increased emphasis is being laid on development of methods for the production of suitable substitute fatty acids from surplus animal fats to meet the requirements of the soap industry. Great emphasis is likewise now being given to the synthesis of suitable antioxidants for preservation of lard. This activity has important defense aspects in connection with efforts to improve keeping qualities of certain essential items in food rations as well as in shipping and storing this commodity abroad under unfavorable conditions.

Potato utilization investigations: Initial investigations involved studies on the dextrinization of potato starch with the object of developing new and improved methods for the preparation of dextrines suitable as adhesives for specialized purposes such as for stamps, envelopes, labels, etc. Imported materials are now used largely for this purpose. No conclusions have been reached as yet because of the very preliminary nature of the experiments but it is hoped that this extensive outlet for starch may thus be opened to American potato growers.

Scarcity of shipping facilities has made certain a shortage of root starches during the coming year. Normally about 400 million pounds of such starches are imported annually and the restriction of this supply will seriously affect many industrial operations. Special emphasis is therefore being placed on studies to adapt and modify potatostarch for those uses which require the inherent properties of root starches. Considerable technical assistance is being given in connection with efforts to promote adequate domestic production of root starches and thus alleviate the impending shortage.

Tanning materials, hides, skins, and leather utilization investigations: Two-thirds of our domestic supply of tanning materials comes from the American chestnut tree, which is being exterminated by a blight. Research work on development of domestic tanning materials has been actively continued in cooperation with the Bureau of Plant Industry and Soil Conservation Service. Canaigre plantings have been harvested in New Mexico, Texas, and several southeastern states. Irrigation appears to be essential in arid regions to secure acceptable yields. Results indicate that irrigated crops of canaigre may





yield 10 to 16 tons of fresh roots per acre, containing about 22% tannin. Possibilities of growing Tara in this country pursued. Other sources of tanning being investigated are Sitka spruce bark from Oregon and Washington, the Pithecellobium dulce trees growing in Florida, Chinese chestnut (*Castanea mollissima*), Acacias, Tung hulls, sage brush, creosote bush, Tamarix articulata, and others.

New methods of curing hides and skins and more scientific systems for determining those qualities that will reflect more adequately their leather-making value are being sought. Work on an original standardized procedure and results on the efficiency of 40 different formulas for curing hides and skins with salt, plus various other chemicals, has been completed. Additional tests of chemicals not previously tried are in progress. A five-year experiment on the effect of prolonged cold storage on salted calfskins has been completed, and the data are being assembled.

Actual tanning to develop shorter and better methods of making leather are being carried out. Preliminary studies have shown that vegetable-tanned leather retanned with alum has an exceptional resistance to acid deterioration. This is an important new observation and is being actively followed up by application of the same tannage to several types of leather, the properties of which are being measured. In continued collaboration with the Government Printing Office 20 current deliveries of combination vegetable and chrome tanned leather s for public binding work have been subjected to accelerated aging and tested physically and chemically for permanence. Because of greatly increased purchasing of leather by the Government, many questions have arisen pertaining to Federal Specifications for leather. Through membership on the Committee on Leather, assistance has been given in revising present specifications for harness, sole, belting, and lace leathers. Actual service tests are being continued on 60 volumes of Chemical Abstracts bound in vegetable and chrome tanned calfskin leathers.





WESTERN REGIONAL RESEARCH LABORATORY

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)
1. Construction and equipment of building...	\$155,625	\$76,000	\$93,000
2. Apple utilization investigations.....	26,289(a)	73,000(a)	93,200(a)
3. Alfalfa utilization investigations.....	59,510	117,800	148,900
4. Fruit utilization investigations.....	150,713	202,850	256,500
5. Potato utilization investigation.....	19,038(b)	39,500(b)	50,000(b)
6. Poultry utilization investigation.....	78,374	120,800	152,750
7. Vegetable crop utilization investigation	104,524(c)	136,000(c)	172,000(c)
8. Wheat utilization investigation.....	33,390(d)	69,100(d)	87,400(d)
9. Technical features of construction and design.....	7,717	--	--
10. Plans and specifications and supervision of construction.....	19,066	--	--
Total.....	654,246	835,750	960,050

(a) (b) (c) Joint commodity projects with Eastern Laboratory

(d) Joint commodity project with Northern Laboratory

Examples of progress and current program:

1. Construction and equipment of buildings:

Actual construction of all of the units comprising the Western Regional Research Laboratory has been completed and final phases of installation of equipment are in process. All of the requested buildings and equipment of the laboratory will be completed and operating under full capacity by the end of the fiscal year 1942.

2. Apple utilization investigation:

Research on the freezing preservation of cull and low-grade apples has produced a sliced product of higher quality than can be obtained by other methods and one which finds a large market in the baking trade. Suggested methods to prevent browning of the frozen slices are now employed by the industry.

Semi-pilot plant scale studies have produced an apple powder of low moisture content which promises to be of considerable use to bakers in retarding the staling of bread. An experimental spray drier suitable for producing apple powder has been designed and is now being built. Well-flavored apple jelly, apple drink and apple butter may easily be prepared by the housewife.

Current studies indicate that apple pectin is equal to gum tragacanth as an emulsifying agent for olive oil. Heretofore, approximately 24 million pounds of tragacanth and similar gums have been imported annually from the Eastern Mediterranean countries, but these gums are now practically unobtainable.

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Mixed metallic pectinates which have been derived by the partial hydrolysis of pectin exhibit interesting properties of gel formation in water without the addition of sugar or acid. Utilization of the pectinates in food preparations and for industrial purposes will be studied to determine their value in the production of concentrated rations. The possibility of using in medicine galacturonic acid made by the chemical or enzymic hydrolysis of pectin is under investigation and arrangements have been made for clinical trials. Galacturonic acid may prove to be an important starting material in the synthesis of vitamin C.

### 3. Alfalfa utilization investigations:

War shortage of fish liver oils as sources of vitamins A and D has directed attention to crops which contain carotene, the yellow pigment which the animal body converts to vitamin A. Alfalfa is one of the more promising sources of this compound but its carotene content is rapidly diminished by oxidation under ordinary conditions of curing and storage. It has been found that rapid artificial dehydration reduces the loss of carotene which occurs during field curing. Storage of the dry hay in the atmosphere of low oxygen content further reduces the loss. Studies are underway to find means of cheap and effective storage. The effect of enzymes upon carotene stability is also being investigated.

Promising methods have been developed for the stabilization of beta-carotene concentrates as a substitute for vitamin A from fish oils. This is of utmost importance in National Defense.

The results of attempts to make high protein food concentrates from dried ground alfalfa by means of electrostatic segregation of the protein from the fibrous constituents warrant further research along this line.

Methods of isolation, purification and modification of hemicellulose are being studied in order to apply such information to the problem of commercial recovery and utilization of the hemicellulosic constituents of alfalfa.

### 4. Fruit utilization investigations:

The freezing concentration of fruit juices and related products offers the opportunity of optimum retention of flavor, color and nutritional value and a laboratory device of preliminary design is under test. Soft, ripe, and off-shape fruits are also used to excellent advantage in the manufacture of frozen crushed and pureed fruits and a rapidly expanding industry has been based upon techniques developed by the Bureau on the utilization of material previously discarded as unfit for market. A determination of ice crystal size in fruits resulting from quick freezing and storage is being carried on to learn what relation exists between ice crystal size and keeping qualities.

A new method of cold packing small fruits for jam preserve or soda fountain use is being investigated, the objectives being a better preserved product, better sanitation, lower cost of package and a more uniform material for processing by the manufacture.





Studies are in progress on methods of recovery, refining, and stabilizing of vegetable oils, fats and waxes, obtainable from nuts, and seed kernels and flesh of fruits. Particular attention is being given to the determination of chemical and physical properties of these oils and their derivatives in order to ascertain their position in our oil economy and their possibilities as substitutes from imported and difficult to obtain oils.

Pectin investigations as applied to apples are being pursued on other fruits particularly of the citrus varieties.

Investigations of the molecular structures and optical properties of plant pigments are under way. Structural changes which result from dehydration, quick freezing or cold storage of fruits will be determined as a basis for developing or modifying the process involved.

Substantial portions of fruit crops are unmarketable as fresh fruit because of market grading requirements, surpluses above market capacity, freezing, or damage by insect pests. Information regarding supplies of cull or low-grade fruits and fruit processing wastes is being collected in order to determine the size and location of plants which may utilize these materials economically as preserved or frozen products.

Juice from pears and dried prunes has been used as a medium for growing yeast as a feed or food supplement. Yeasts seem to concentrate within their cells certain nutritional constituents of the fruit as well as to synthesize nutritional factors and to convert part of the fruit carbohydrates to yeast protein. Fermentation apparatus and procedures are being developed to provide optimum conditions for yeast growth with regard both to yield and composition or nutritional value, especially vitamin potency.

Experiments in progress with winery pomace indicate that partial neutralization with lime seems to be necessary to permit satisfactory conversion to humus. Decomposition proceeds most rapidly under thermophilic conditions. The humified product obtained seems to be valuable for soil improvement and is definitely important in some areas of the West where organic materials are deficient.

Research dealing with a blood pressure reducing substance in pears is being started. Clinical reports indicate that ingestion of pears has been beneficial to people suffering from high blood pressure.

#### 5. Potato utilization investigations:

Data regarding the supply of cull and low-grade potatoes, the length of the grading season, varieties grown, the degree of concentration of the crop into large grading and packing houses, as well as other economic factors are being studied from the standpoint of rational utilization of the crop as raw material for industrial processing. Ensiling in mixtures with other crops has been used to some extent.

A research program, carried on in cooperation with the Idaho Extension Service and Experiment Station, is underway to investigate methods of cutting waste potatoes into uniformly sized pieces, methods for handling wet and dry products, and to design cheap, portable drying racks. In semi-arid regions such as the Snake River Valley of Idaho and Central and Southern California, field drying has been found possible. In these semi-arid regions weather conditions for such





drying are favorable during 5 to 6 months when cull potatoes are available. Recovery of starch or alcohol will be investigated in cooperation with the Eastern and Northern Regional Laboratories.

Recently both the Army and Navy have requested bids on considerable quantities of dehydrated potatoes, presumably for use in emergency rations and for food depots at isolated posts. Anticipating rapid emergency expansion of the dehydration of food products, a study is being made of modifications of the existing fruit dryers and improvements in commercial drying methods. Means of maintaining the vitamin C content of potatoes during storage and methods of packaging the dried product to withstand tropical and other adverse conditions are being investigated.

#### 6. Poultry utilization investigations:

Based upon principles believed not to have been used heretofore in protein fiber production, fibers of superior strength, stability and color have been produced from purified egg albumin and from the whole liquid egg white as a starting material. New protein fibers both as supplements and as substitutes for silk and wool, would relieve shortages in emergency situations, help stabilize wool prices in normal times, and provide an additional source of fibers having properties now lacking in cellulose fibers.

Due to the present shortage of casein, an important ingredient of plywood and other adhesives, cheap substitutes for casein are urgently needed. The potentialities of feathers and similar proteins for adhesives and glues are being investigated.

Quick frozen liquid whole eggs are becoming of increasing importance in the baking and confectionery industries. Bacterial control and more effective methods of quick freezing, packaging and storing the product are being investigated

Lend-Lease operations have caused an increased demand for dried eggs. In cooperation with State and private organizations in the Pacific Northwest, studies are underway on quality control, causes and remedies for loss of vitamin content, and for bacterial contamination and deterioration of the stored product.

Experiments have been started to isolate and recover from eggs the constituents which have gland stimulating properties. Natural substances containing these active principles are not common and a search for new potential and relatively inexpensive sources is underway.

Serious losses are experienced by the industry because of partial drying out of poultry during frozen storage. Research to measure and control humidity of air at low temperatures is being started in order to find practical ways to decrease this type of storage loss. Because protection from dehydration and the retention of quality in frozen poultry products can be obtained by efficient packaging with moisture-vapor proof materials, effective methods of sealing packages and coverings and package materials are being tested.

Comparative investigations of drawn and undrawn chickens preserved by freezing are in progress with a view to improving the quality of the meat after freezing. It is hoped to stimulate the practice of freezing drawn poultry since the products of evisceration may then become a source of raw materials important in wartime.



A study of the structural changes occurring in the tissue of poultry when quick frozen is being undertaken by X-ray diffraction method as a basis for modifying the present freezing practices for greater efficiency and more satisfactory retention of quality in the finished product.

#### 7. Vegetable utilization investigations:

The wastes accompanying harvesting and preparing vegetables for the market are about 50 percent of the crop. An economic survey of the factors involved has been undertaken with the purpose of finding new uses for culls and harvesting wastes. Chemically, these materials consist of water and fibers. Return of the fibrous materials to the soil as fertilizer seems to be the best use for them. Investigations underway indicate that methods of preparing good fertilizers on commercial scales are likely to prove feasible. Some of the vegetable fibers have been found utilizable as fiber board materials and a patent application has been made for a processing method for fiber board manufacture.

The possibilities of obtaining from vegetables, products which may be valuable in medicine are being studied and results indicate that some vegetable juices are of special value as culture media for growth of bactericide-producing organisms. The use of vegetable waste juices as source materials for commercially useful enzymes is being investigated with encouraging results. Oils and pectin from vegetables are available in quantities and economic methods of isolation and of new uses through alteration of chemical and physical properties are being sought.

The present emergency has served to emphasize the need for food products that may be more economically stored and transported. Removal of water should reduce both transportation and storage costs and prolong storage life. Accumulation of large stores of vegetables for use in post-war food shortage emergencies will be of vital importance. The food values of most vegetables are largely determined by success or failure to retain especially valuable nutritional factors. Efforts are being made to prepare for the rapid emergency expansion of the vegetable dehydration industry. Improvements of present methods are being tried out on a small plant scale, special attention being given to maintaining those quality factors upon which nutritional value and consumer acceptance depend.

Storage of some vegetables in the frozen state has proved to be commercially feasible since valuable factors that determine quality have been retained by freezing. Laboratory and pilot plant work are in progress. Objective tests for maturity and quality control are being sought for a number of vegetables such as peas, sweet corn, lima beans, soybeans and asparagus. Fundamental data have been assembled for the development of consumer grades.

#### 8. Wheat utilization investigations:

Data on wheat production in the West are being collected. Analyses will be made of geographical concentration by types and grades, in cooperation with the Commodity Development Division of the Northern Regional Research Laboratory.

Samples of hemicellulose and related products of wheat straw have been prepared and work is now in progress on their characterization and determination of structure for the purpose of comparison with hemicellulose from other sources.

Investigations of possible biological and pharmacological substances present in wheat plants are being initiated. These include the concentration of





biologically active substances.

The technological adaptability of wheat proteins for new or improved industrial utilization requires finding suitable methods for the isolation and recovery of the protein itself. The next step is to study and measure the distinctive properties of the material, with special emphasis on those properties that are most likely to determine industrial values and limitations. Investigations along these lines are well under way, with reference to the so-called gluten of wheat flour.

Gluten is very sensitive to treatments and conditions, such as temperature, acidity, mechanical manipulation, method of drying, etc. The effects of these treatments upon the properties and stability of the protein are being systematically studied, the objective being to develop, by economically feasible methods, a stable product having industrially favorable and uniform characteristics.

Preliminary laboratory trials indicate that artificial fibers having reasonably good properties can be made from gluten protein by methods that may be well within the range of economic feasibility. Fibers having good color, stability, and fair strength have already been produced experimentally. Possibilities for other types of industrial utilization will be investigated.

#### CENTRAL ADMINISTRATION, PLANNING AND COORDINATION

This project provides for the administrative supervision and direction of the work of the laboratories. Its objects are (1) to develop a well coordinated research program for the four laboratories, (2) to maintain proper control in order to avoid duplication of research activities, and (3) to maintain in Washington centralized control and direction of the business activities necessary for the proper functioning of the organization as a whole, including personnel, budget, bookkeeping, auditing, purchase and property, editorial and information, files, library, etc.

During the past year a detailed research program has been drawn up and placed in operation after consultations with Division Chiefs within the Bureau, the Director of Research of the Department, Bureaus of the Department, the 48 State Experiment Stations, and other related governmental agencies.

Where necessary this program has been redirected, or the emphasis shifted within the purposes for which the laboratories have been established to meet current or anticipated wartime problems arising out of shortages in the production of industrial materials to meet increased military and civilian demands. Steps are under way to further the decentralization of the business operations of the laboratories by the transfer of added procurement responsibilities. All bookkeeping, auditing, and routine procurement activities were transferred to the laboratories as of July 1, 1941.





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EMERGENCY DEHYDRATION INVESTIGATIONS

Second Supplemental National Defense	
Appropriation Act, 1942 .....	\$144,000
Budget estimate, 1943 .....	- -
Net decrease .....	<u>144,000</u>

PROJECT STATEMENT

Projects	1941	1942 (estimated)	1943 (estimated)	Increase or decrease
1. Improvement of methods of production and distribution of dehydrated foods .....	- -	\$70,000	- -	-\$70,000(1)
2. Effect of dehydration process on the quality, uses, and nutritive value of foods.	- -	74,000	- -	- 74,000(1)
Total .....	- -	144,000	- -	-144,000(1)

DECREASES

(1) Decreases totaling \$144,000 under this item due to the completion of emergency dehydration investigations, for which \$144,000 was appropriated in the Second Supplemental National Defense Appropriation Act for the fiscal year 1942.

CHANGE IN LANGUAGE

It is proposed that the following language which authorized this work be eliminated in the 1943 bill:

Emergency dehydration investigations: For all necessary expenses to enable the Secretary of Agriculture to conduct investigations for the improvement of production, distribution, quality, and nutritive value of dehydrated foods, fiscal year 1942, \$144,000.

WORK UNDER THIS APPROPRIATION

Objective: The improvement of production and distribution of dehydrated foods including research on quality and nutritive value.

The problem and its significance: The substitution of dehydrated for perishable foodstuffs is a national defense problem of great importance. This problem involves the overtaxed domestic, coastwise and ocean transportation systems. It affects the diet of our peoples and of our armed forces at their posts. It



also affects the morale of friendly combat forces to whom we send foodstuffs, because the nutritional value, the palatability, and the vitamin content of necessary dehydrated foods are important in the maintenance of health and vigor of combatants.

General plan: The problem falls into two distinct phases: First, emergency preparation for rapid expansion of commercial facilities; and, second, the necessarily slower phase of developing new processes, which will improve the palatability, appearance, or vitamin content of commercial dehydrated foodstuffs.

Current program: Because of the emergency, problems relating to dehydrated foods are being attacked simultaneously upon several fronts, as follows:

- (1) Survey of present factory capacity and equipment for dehydration of food; of existing patents covering dehydration methods; of processing plants available for dehydration of other products (such as hops and alfalfa) to determine whether they can be adapted to food dehydration.
- (2) Study of dehydrated foods now being produced and of production processes to determine: (a) the effect of these processes upon the nutritive value and palatability of the foods; (b) the keeping quality of the dehydrated products during storage and what changes, if any, occur in nutritive value, as for example, in vitamin content.
- (3) Research designed to improve current production processes and packaging practices, on the basis of the studies of dehydrated products outlined in (2) above.
- (4) Study of ways of effectively using dehydrated products in civilian defense and in military rations.
- (5) Emergency preparation for rapid expansion of commercial dehydration facilities using the knowledge we already possess. This includes plans and specifications for the quick duplication of existing commercial plants, taking into account the critical shortages in many engineering materials.

The Bureau of Agricultural Chemistry and Engineering of the Department is conducting the research on commercial manufacturing, packing, storing and marketing; the Bureau of Home Economics on the standardization of the vitamin content of the finished product; the effect of storage upon vitamins; the effect of subsequent treatment and cooking upon vitamins; and the use of dehydrated foods in special feeding situations.

